ARCHAEOLOGICAL STUDIES AT COMANCHE SPRINGS AND METZLER RUIN

VALENCIA COUNTY, NEW MEXICO: AN OVERVIEW

By

Lucy C. Schuyler

MAXWELL MUSEUM
OF ANTHROPOLOGY
UNIVERSITY OF NEW MEXICO

Maxwell Museum Technical Series No. 32

Maxwell Museum of Anthropology
MSC01, 1050, 1 University of New Mexico
Albuquerque, New Mexico 87131-0001
maxwellmuseum.unm.edu

2019

TABLE OF CONTENTS

TABLE OF CONTENTS, *continued*

FIGURES

TABLES

Page

ACKNOWLEDGMENTS

My thanks to the following individuals for their assistance during this project: Karen Armstrong and her crew of fellow volunteers, Kym Campbell, Carolyn Gabe, Phil Geib, Kath Linn, Dave Phillips, Ann Ramenofsky, Diane Tyink, and Bruce Walborn.

Lucy C. Schuyler
Albuquerque, N.M.

Chapter 1

INTRODUCTION

The analysis and data integration project that led to this report had two objectives: to summarize what is currently known of excavations at two sites, Comanche Springs and Metzler Ruin in New Mexico, and to provide electronic catalogues that combine all known surviving data from the excavations, subsequent research, and artifact analyses. The catalogues, and the original data obtained to create them, will be available for research at the Maxwell Museum of Anthropology. This report serves as a guide for each site's artifacts and documents in the museum collections. Figure 1 shows the location of Comanche Springs. Metzler Ruin is east of that site, at the base of the Manzano Mountains.

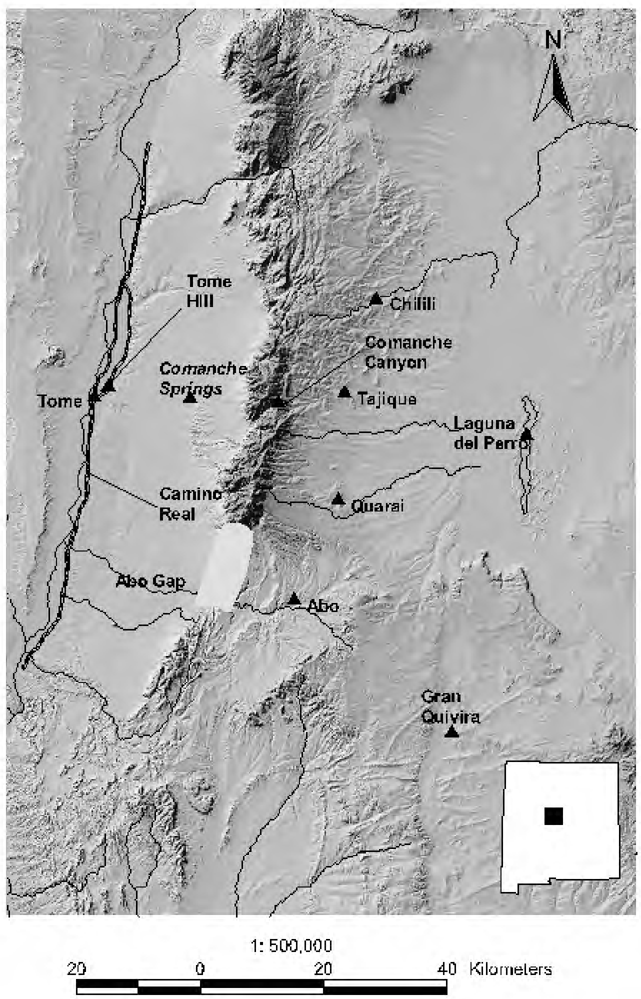


Figure 1. General location of Comanche Springs. Source: Shawn Penman. Courtesy of Ann Ramenofsky, 2016.

From the 1950s to the 1970s Frank Hibben led excavations at both sites, focusing on Archaic period bison bone beds and on early Spanish settlement. In the 1990s Ann Ramenofsky and a small crew conducted excavations at Comanche Springs to reevaluate metallurgical artifacts and features found by Hibben, and to establish a more exact timeline for the Spanish occupation at that site. She describes that work in Chapter 3.

Comanche Springs (also known as Los Ojuelos, meaning “the small springs”) is the location of three springs near the center of the Tome Land Grant, 16 km (10 miles) east of Tomé, in Valencia County, New Mexico (Melzer n.d.:1). The archaeological site known as Comanche Springs, LA 14904, covers about 5.9 ha (14.6 acres), with two springs within the site boundaries and a third very close by (Ramenofsky and Vaughan n.d.:6).

Tomé Dominguez de Mendoza was awarded a land grant near Tomé Hill by 1662. The *estancia* he established there appears to be the earliest documented Spanish settlement in the Tomé area (Chavez 1954:25; Ellis 1955:89; both cited in Seifert [1980:23]). De Mendoza left the area during the Pueblo Revolt of 1680 and abandoned the claim (Seifert 1980:24). In 1739, 30 Spanish settlers obtained a communal land grant (Julyan 1998:356) that contained de Mendoza’s earlier grant (Scurlock et al. 1995:75).

Within the grant, the Comanche Springs area provided the only permanent water between the Rio Grande and the base of the Manzano Mountains. The springs emerge at a dissected low alluvial bluff that follows a fault line, so the location also provides a good view of the countryside between the river and the springs. The dominant local vegetation was grassland, now degraded into scrubland. Given the combination of reliable water, good grazing land, and a good view of pasturage, it is unsurprising that the colonial Spanish established an outpost at Comanche Springs. In contrast, Native Americans used the location as a hunting and camp site. The name “Comanche Springs” is not a land developer’s invention but a reminder that Native Americans continued to use the area into historical times.

Any overview of archaeological studies at Comanche Springs must also consider Metzler Ruin (LA 103997), because Frank Hibben excavated at both sites during the same period and because his collections and field notes became commingled. Metzler Ruin is 8 km (5 miles) southeast of Comanche Springs, at a substantial spring (Ojo la Casa) at the mouth of Comanche Canyon. The Metzler Ranch headquarters is next to the spring and has piped the spring for its own use. The spring may explain the location of the site.

Hibben excavated at Comanche Springs in the 1950s, 1960s, and 1970s. His publication (Hibben et al. 1985) includes general descriptions of the excavations and artifacts. The report indicates that Hibben brought various experts to the site during these years to assist in the excavations and identify certain categories of artifacts. The artifacts are mentioned repeatedly throughout the commentary, and each new mention does not necessarily represent an additional artifact. I indicate where artifacts were found when that information is available.

The Horizon Corporation (of Tucson, Arizona) purchased the Tomé land grant in 1968. According to Hibben et al. (1985:42), local collectors gained access to the grant at that time and reported finding Sandia points, Clovis fluted points, Folsom points, Desert Archaic stemmed points, Pueblo glaze pottery, and Civil War era bullets and shell casings. In 1975, Horizon Corp turned the property over to Horizon Communities Improvement Association and Comanche Springs was given a site number, LA 14904 (Seifert 1980:3). Comanche Springs was listed on New Mexico's State Register of Cultural Properties in 1976 and on the National Register of Historic Places in 1987.

As part of this project, I created artifact and document catalogues, in the form of Excel spreadsheets, for each site. Many of the Comanche Springs artifacts have been analyzed over the years and the resulting data had been stored in a variety of electronic data sets. As much as possible, I have combined the data for each individual artifact and have identified whether it was found by Hibben or Ramenofsky.

Chapter 2

HIBBEN'S EXCAVATIONS AT COMANCHE SPRINGS

During his work at Comanche Springs, Frank Hibben received assistance and information from Mr. Juan Cordova, who owned a ranch just north of the site, and from Mr. Tibo Chavez, a politician and historian in Belen (Hibben et al. 1985:42). Mr. Cordova first showed Hibben the site in 1934. Hibben's next visit to the site took place no later than 1950 (Hibben et al. 1985:43). Subsequently he visited or worked at the site on multiple occasions.

At Comanche Springs Hibben identified one site component as early Spanish Colonial; this component included three masonry structures and fragments of majolica and late Native American glaze ware pottery (Hibben et al. 1985:42). About 1950, Hibben and John Goggin dug four test pits in the center structure (Structure B). Hibben stated that during this work, Goggin identified Majolica pottery from Puebla, Mexico and Spain plus three pieces of Middle Ming dynasty (1368–1644) porcelain (Hibben et al. 1985:43, 53).

Hibben further claimed that during several other visits to the Spanish buildings in the 1950s and 1960s, he and Alden C. Hayes found Majolica ware, armor fragments, musket balls, late Native American glaze ware sherds, and sherds tied to the Piro sites of Abo and Gran Quivira (Hibben et al. 1985:43).

Hibben also located two bone beds (or two exposures of the same bed) along the major drainage, the Ojo Alamo, that bisects the site. One bone bed was found below the spring of the same name; a second bone bed (the Dimick area) was found above the spring (Hibben 1992:18–19). Hibben later claimed that he and Frank H. H. Roberts Jr. identified the exposed bone as mammoth, horse, and bison (Hibben et al. 1985:42). Hibben further claimed that collectors had found Sandia, Clovis, Folsom, Pinto, and Jay points in the area (Hibben 1992:18).[1] Other reported remains associated with the bone beds included hearths with fire-cracked rock, milling stones, one-hand manos, notched points, quartzite flakes and cores, two *jacal* (wattle-and-daub) houses with post holes, and scattered fire-cracked rock (Hibben 1992:19).

In 1971–1974, Hibben excavated the bone bed(s) in Ojo Alamo. The exposed bison remains proved to be of Late Archaic age. Figure 2 features the larger bone bed, with the Dimick area shown as an inset. Figure 3 provides a partial plan of the Dimick area. The upper (Dimick) bone bed supposedly yielded bones from 10 animals and the lower bone bed yielded bones from 40 animals (Hibben 1992:22). Hibben reported that 10 notched, stemmed points were found in the lower bed (seven chert and three obsidian) and that two of the points were found in bone. No points were found in the upper bed (Hibben 1992:26). Hibben reported that radiocarbon samples assayed by Case Western Reserve University dated the upper bed to 2920 ± 280/230 BP and the lower bed to 2640 ± 280/290 BP (Hibben 1992:18).

[1] Hibben's 1992 publication appears to be modified from a manuscript that lists a student as the principal author and Hibben as the co-author (Maxwell Museum Cat. No. 2009.30.12).

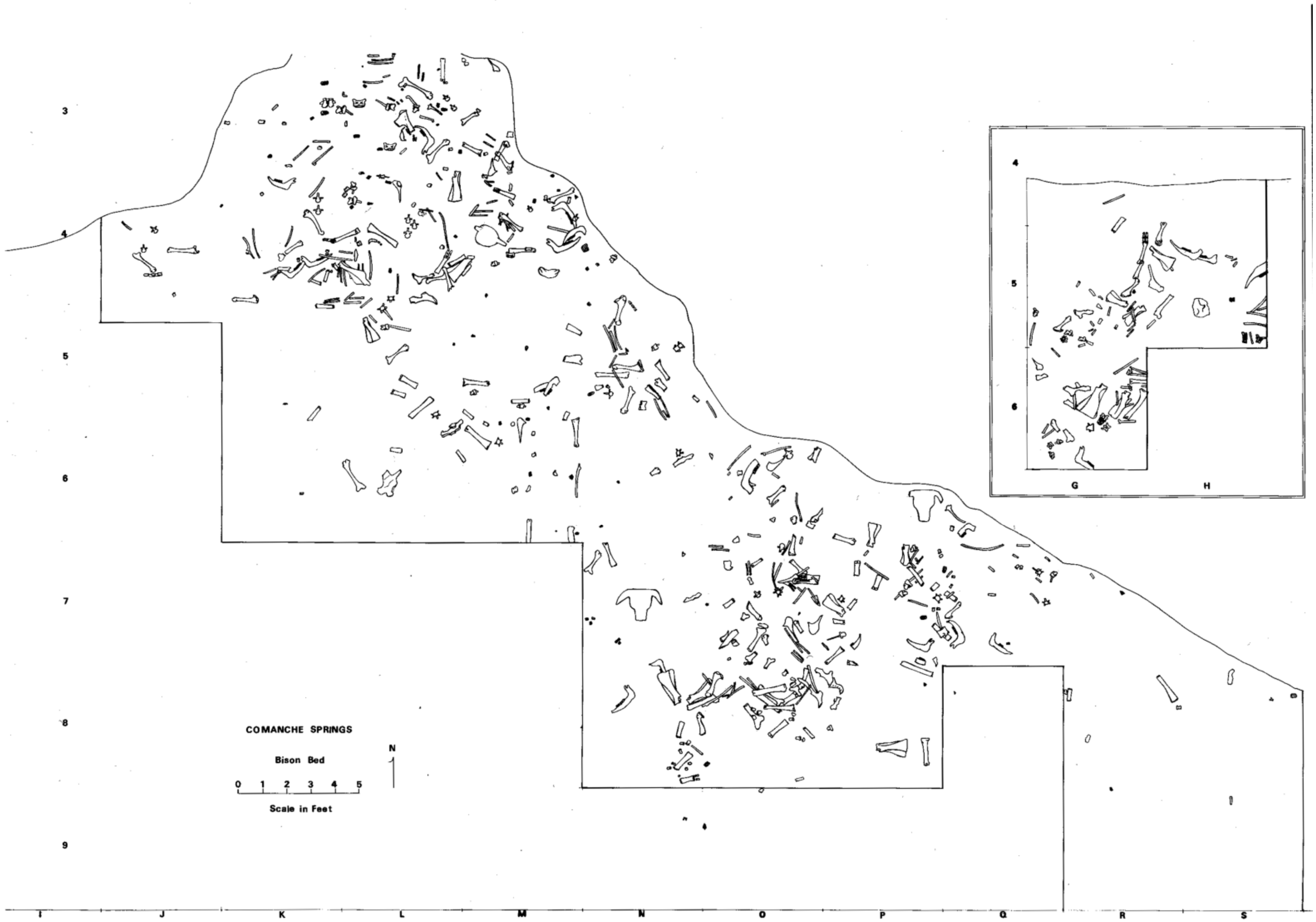


Figure 2. Map of the bone beds. The Dimick area is shown in the insert. From Hibben (1992, Figure 2).

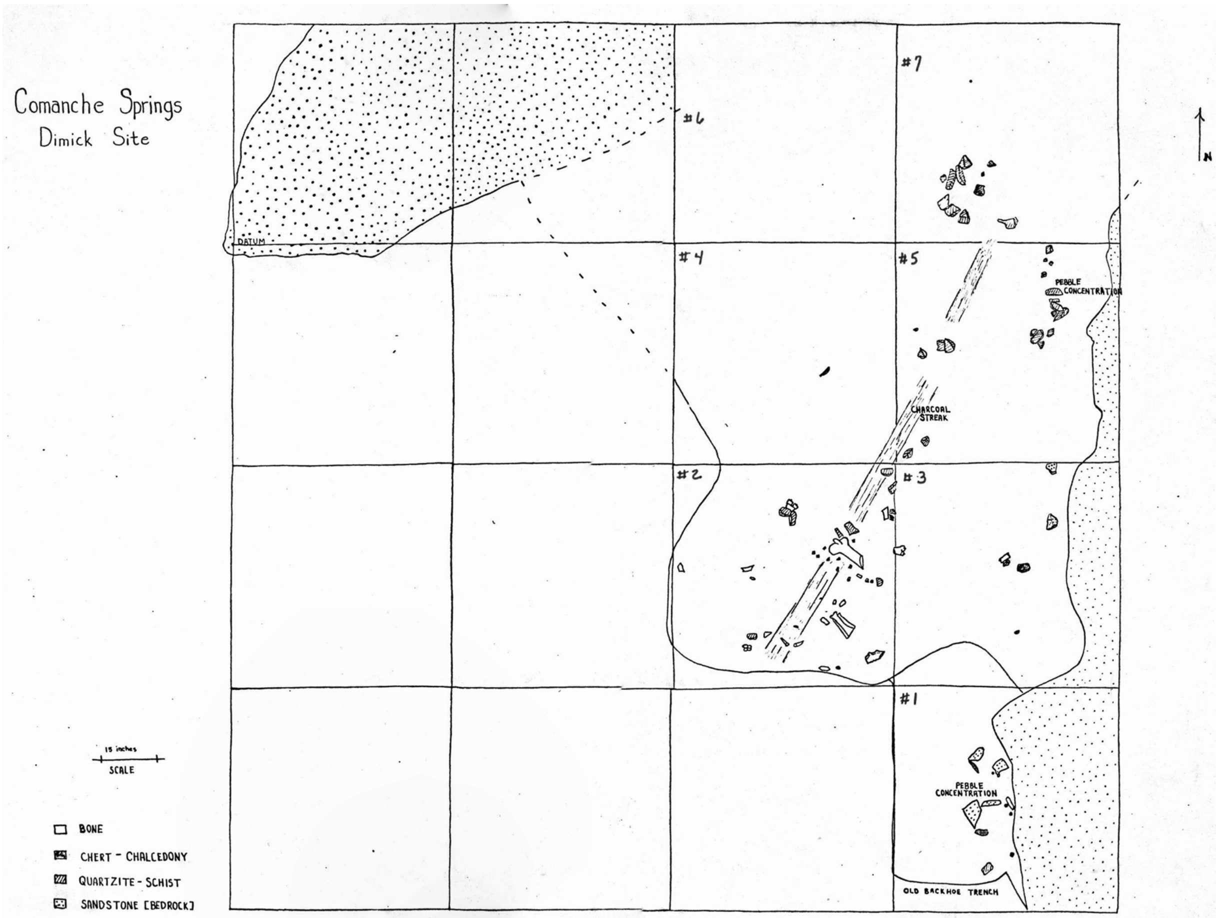


Figure 3. The Dimick area. Based on a comparison to the inset in Figure 2, this plan was prepared after partial excavation. Cat. No. 78.42.10.

Hibben stated that Kirtley Mather (of Harvard University's geology department) visited the site to examine the stratification at the bison bed(s) (Hibben et al. 1985:43).

In 1975 Hibben returned to the site with 12 excavation "veterans," including Tommy Fulgram (who supervised the field operations) and Ben Benjamin (who was in charge of mapping). The crew identified three Spanish structures, A through C. Hibben reported that each had a different surface plan and all contained Native American glaze ware and slag (Hibben et al. 1985:43). Hibben indicated that Structure A was not excavated and that Structure C was only exposed enough to determine its plan and that most of its fill was left intact (Hibben et al. 1985:44). Later excavations led by Ramenofsky found that all three structures had been excavated (Ann Ramenofsky, 2017 personal communication).

Structure B

Hibben's excavations of Spanish structures focused on Structure B (Figure 4). He described the structure as a Spanish house that faced south, with fortified gun ports, a firing platform, and a *sala* (hall)[2] in the central portion that had been built by Native Americans. At the east end of the *sala*, a rectangular adobe altar covered with fabric was reported, along with remains of thick leather. Majolica fragments were found between the altar and the *sala*'s east wall (Hibben et al. 1985:44). The crew also found Glaze E sherds in the *sala* (Hibben et al. 1985:45).

Hibben also reported a corner fireplace and firing steps in the east room (Hibben et al. 1985:44).

A kitchen was reported in the south east corner of the building; a raised portion in the room's center, for a stove, was covered by a layer of charcoal. Most of the pottery found in the kitchen was utility ware (Hibben et al. 1985:44). Others have suggested that the possible "stove" was really a metallurgical hearth (Vaughan n.d.:11).

Hibben thought that Native American "servants" occupied a large room in the west part of Structure B, since they found a burial of a premature infant in a shallow grave under the floor and Native American glaze ware pottery including an almost complete Glaze E bowl (Hibben 1985:44).[3] In this west room, the excavators also found a silver crucifix, twelve circular potsherd Native American "prayer wheels," three "prayer wheels" made from flattened musket balls, and eighteen flint and obsidian points (Hibben et al. 1985:44).

The sherd "prayer wheels" were identified by Acoma informants as similar to those used with prayer sticks (et al. Hibben 1985:51), and later identified as spindle whorls (Ann Ramenofsky, 2018 personal communication). Most (1,800 of the 3,000) Native American sherds were "Salinas redware" with some katsina designs, mostly in Spanish shapes (Hibben et al. 1985:54).

The surviving interior wall between Structure B's *sala* and its west room was reported as five courses of adobe, with gun ports with selenite covers in the first course, on top of the foundation. Hibben also reported finding selenite squares in the fill of other rooms, which led to the reported number and locations of the gun ports (Hibben et al. 1985:45).

Hibben described two main doorways with high stone sills, one to the south, opening to the middle of a patio, and the other to the west. He also described walls consisting of stone foundations topped with courses of adobe bricks (Hibben et al. 1985:44). The roof had been built with vigas and latillas. The portal was on the south side of the structure and included four gun ports. Hibben did not identify any corrals identified but reported domestic animal remains in and outside Structure B (Hibben et al. 1985:45).

---

[2] Hibben further identifies the *sala* as a chapel, but the word indicates the hall (main room) of a residence. A family altar would not be out of place in a rural hall.

[3] The infant remains are now in the Laboratory of Human Osteology at the Maxwell Museum of Anthropology, University of New Mexico. No artifacts are stored with the burial (Will Marquardt, 2015 personal communication).

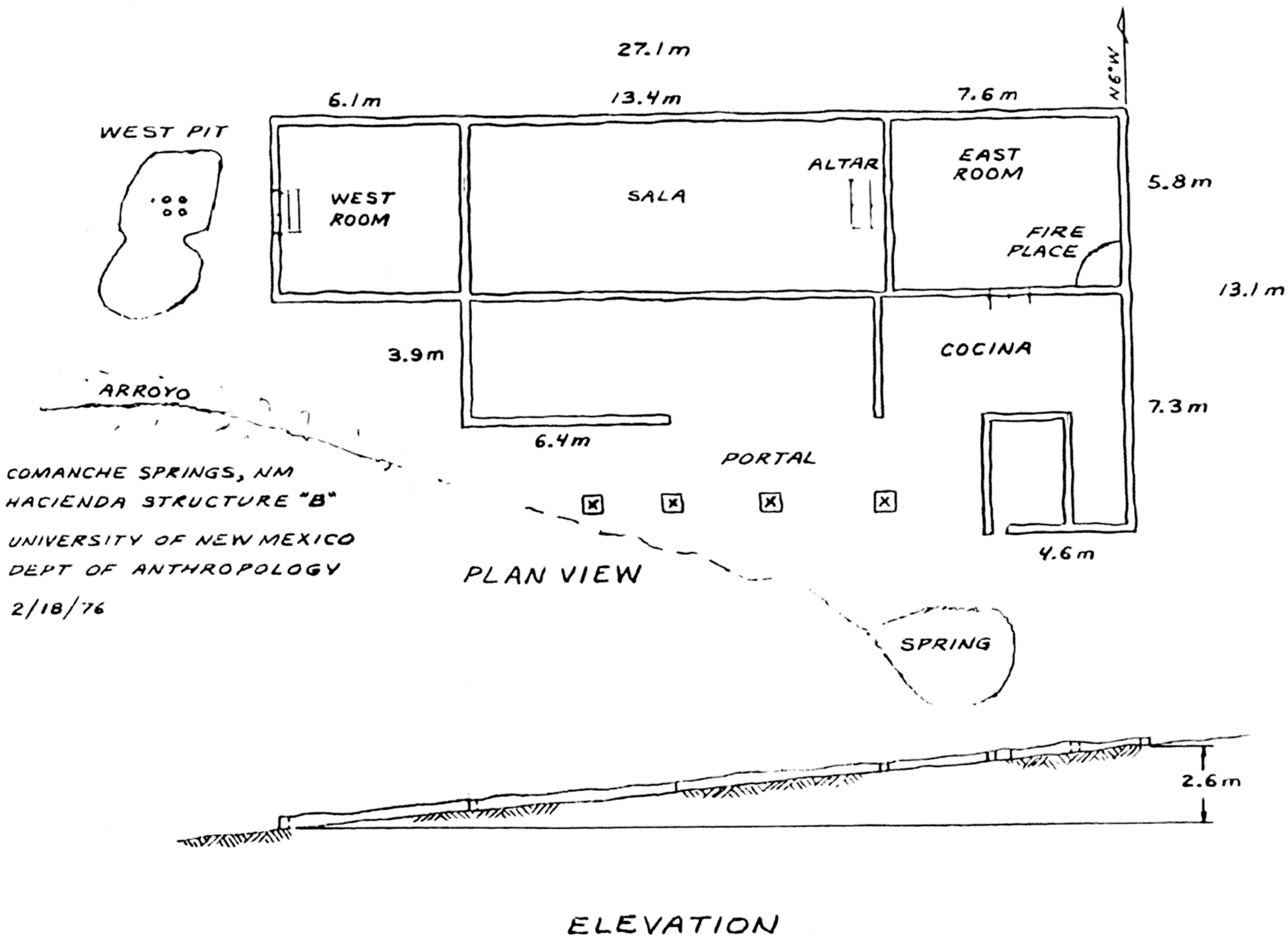


Figure 4. Structure B at Comanche Springs. From Hibben et al. (1985, Figure 1).

Two meters west of Structure B, the crew found two pits of irregular shape, 3 to 4 m wide by 2 m deep.[4] Four post holes were found in the north pit and plentiful debris was found in both. Hibben thought that the pits were first used to make adobe, then converted into refuse pits. The pits reportedly yielded abundant late Native American glaze ware pottery, metal items, and remains of horses, cattle, goats and other domestic animals as well as wild animals (Hibben et al. 1985:45).

Hibben reported that in Structure B and pits west of it, he found 47 pieces of iron, two pieces of chain mail, one almost complete suit of chain mail (found in the pit west of Structure B) (Hibben et al. 1985:50), 39 iron fragments, two Spanish horse shoes, 6 pieces of silver, one silver crucifix (found in the westernmost room) and one brass crucifix (found in the pit west of Structure B) (Hibben et al. 1985:47, 51). Hand made nails and spikes, thirteen pieces of copper wire, and corroded copper sheets were found (Hibben et al. 1985:51). Twenty-five human-shaped and one horse shaped clay figurines similar to "Salinas ware" were found with the metal objects (Hibben et al. 1985:51, 52). Mildred Adler studied the armor fragments (three pieces of morions, three pieces of worked silver found in the western pits that may have been decorations from arquebus locks, fragments from iron crossbows, points of four star-shaped crossbow bolts, six lead musket balls, and five "grape shot") and identified them as coming from two possible periods: either the Spanish explorations led by Coronado (1540–1543) and Espejo (1581–1583) or the early Spanish Colonial period (after 1598). Crossbows were superseded by the arquebus and other weapons by Coronado's time, although he may have been the last explorer to bring crossbows into New Mexico (Rhodes 1997:46). Bolt heads found in the Southwest were made of copper (Rhodes 1997:49). Adler thought that the armor was made in Pamplona. Two pieces of horse armor were identified by Adler and Goggin (Hibben et al. 1985:48, 50, 51). These identifications led Hibben to conclude that the three buildings were built about 1600 (Hibben et al. 1985:49).[5]

Faunal remains were identified by John N. and Stanley J. Olsen (of the University of Arizona) and compared with collections from Gran Quivira and Awatovi. Lists of wild animals and birds and other details are available at the Maxwell Museum (Catalogue No. 95.29.399). Animal bones were fragmented and showed signs of butchering and burning (Hibben et al. 1985:45-47).

Slag recovered from the Spanish buildings included small amounts of silver and trace amounts of copper. Rock samples that may have been ore were found in the northeast corner of the west room of Structure B. Hibben had those samples and some from Pit B assayed by Albuquerque Assay Lab in Albuquerque, and reported that the samples had been milled for use as ore and included a small amount of silver but no gold (Hibben et al. 1985:57). The Albuquerque Assay Lab report (Catalogue No. 95.29.398) lists a metal sample from Pit B as 0.018% silver and 45.5% copper, and a sample from Pit B as 0.0125% silver and 25.2% copper. A spectrographic analysis of four pieces of metal from Pit B was performed by J. F. Wolcott, Sandia Lab; Wolcott's results are dated April 23, 1975 and are included in Hibben's report (Hibben et al. 1985:85).

[4] Ramenofsky and Vaughan examined the artifacts found in these pits. They concluded that the pits most likely functioned, at least in part, as a metallurgical furnace (Ann Ramenofsky, 2018 personal communication).

[5] The collections at the Maxwell Museum do not include an extensive set of armor parts and armaments.

Hibben enlisted a number of experts who evaluated and otherwise offered opinions on artifacts from Comanche Springs (Table 1). I was unable to find original documentation from some of these experts in the Maxwell Museum archives.

Table 1. Hibben's Consultants.

Expert	Evaluations & Opinions
Juan Cordova	Local knowledge
Tibo Chavez	Local historian
John Goggin	Identified Majolica, Oriental ware, and horse armor
Frank H.H. Roberts Jr.	Identified mammoth, horse, and bison bones
Kirtley Mather	Examined bison bed stratification
Acoma "informants"	Identified sherd "prayer wheels"
Mildred Adler	Studied armor fragments, possible decorative elements from arquebus locks, iron crossbow fragments, crossbow bolt points, lead musket balls, and "grape shot"
John N. and Stanley J. Olsen	Identified faunal remains
Albuquerque Assay Lab (David Schwab)	Assayed slag from structures and rock samples
J. F. Wolcott, Sandia Lab	Spectrographic analysis of metal from Pit B
Case Western Reserve	Radiocarbon samples of bone beds

Although Hibben et al. (1985) indicated a possible connection between Comanche Springs and Oñate's entrada, the connection is unlikely. There is no evidence to support his claim of Oñate's prospecting for precious metals near Comanche Springs (Rhodes 1980:22–23). Instead, Spanish artifacts found at Comanche Springs appear to date to 1650–1680, that is, the decades just before the Pueblo Revolt (Melzer n.d.:4). While a sample of gossan (i.e., the upper portion of a vein that oxidized and was converted into goethite) was found at Comanche Springs (Vaughan 2006:200), Hibben's suspicion that Comanche Springs was a silver smelting location has not been supported. Local legends speak of mines whose locations are protected by spirits (Melzer n.d.:5) but no substantial mineral deposits exist on the west side of the Manzano Mountains. As is noted in Chapter 3, Ramenofsky and Vaughan suggested that the Scholle District at the south end of the Manzanos was a potential source of ore processed at Comanche Springs.

Some of the artifacts uncovered during Hibben's excavations at Comanche Springs were available for examination when Ramenofsky revisited Comanche Springs in the 1990s, and formed the basis for her analyses. However, at least 2,000 bags of artifacts collected during Hibben's excavations remained unavailable until an effort undertaken in 2015 (by a volunteer crew led by Karen Armstrong) made them accessible for research. In a brief look through some of these recently available artifacts, a silver crucifix, metal armor fragments, Archaic and Puebloan projectile points, slag, and miscellaneous metal fragments were identified (Ann

Ramenofsky, 2017 personal communication). One student notebook (Cat. No. 95.29.355) contains sketches of artifacts from Pit West of Structure B that depict an iron cannonball, a lead musket ball, and a silver crucifix.

Chapter 3

FIELD INVESTIGATIONS, 1996–1998

Ann F. Ramenofsky

In the late 1990s, the Maxwell Museum of Anthropology asked the author to reexamine the debris from Comanche Springs that Hibben had identified as metallurgical slag (Ramenofsky and Vaughan n.d.:1). After a preliminary examination of records, artifacts, and in consultation with Jacqueline Guilbault of The Valley Improvement Association (the current land owners) I decided to undertake a small project at the site. The goals were straightforward, including an evaluation of whether there were intact metallurgical features or artifacts and establishing a more exact temporal framework for what Hibben believed was an early (Oñate period) Spanish occupation. The latter possibility was significant given our limited knowledge of pre-Revolt Spanish settlements. Because Hibben's records suggested that he had confined his excavations to Structure B, the new field work focused on Structures A and C. As work proceeded, we discovered that Hibben had excavated in all three structures.

To implement the project goals, the following procedures were used:

- Creation of a fine-grained topographic map and site grid, under the direction of Shawn Penman. One result of this work is Figure 5, which shows the site as a whole.
- Scraping of the arroyo cut bank on the southeast side of Structure A (at the north end of the site) to expose and draw a profile that showed the relationship between the cienega soils and structure.
- Auger testing (coring) outside Structures A and C to determine whether metallurgical features, slag, or metal objects were present. If auger tests suggested their presence, 1 by 1 m excavation units were opened.
- Limited excavation within Structures A and C, to seek evidence of use as habitations.

These procedures were used during short field seasons in 1996 through 1998. The Valley Improvement Association provided partial support for the project in 1997–1998.

The laboratory analysis protocol included the following (see also Chapter 6):

- Establishing an Access database.
- Identifying artifacts by raw material; counting and weighing raw material type by unit, level, auger test level, or feature level. Features were given separate provenience designations.
- Site visits, descriptions, and analyses by specialists addressed lithic artifacts (Phil Geib), geology (David Love), geoarchaeology (Ariane Pinson), obsidian sourcing (Richard Hughes), wood samples (Jeffrey Dean), metallurgical debris (Jennifer Boyd, William Chavez, Katarina Vaitkus, and David Vaughan), metal mineral sources (Homer Milford), archaeomagnetic dating (J. Cox), radiocarbon dating (Daren Hood, Beta Analytic), and thermoluminescence dating (James Feathers).

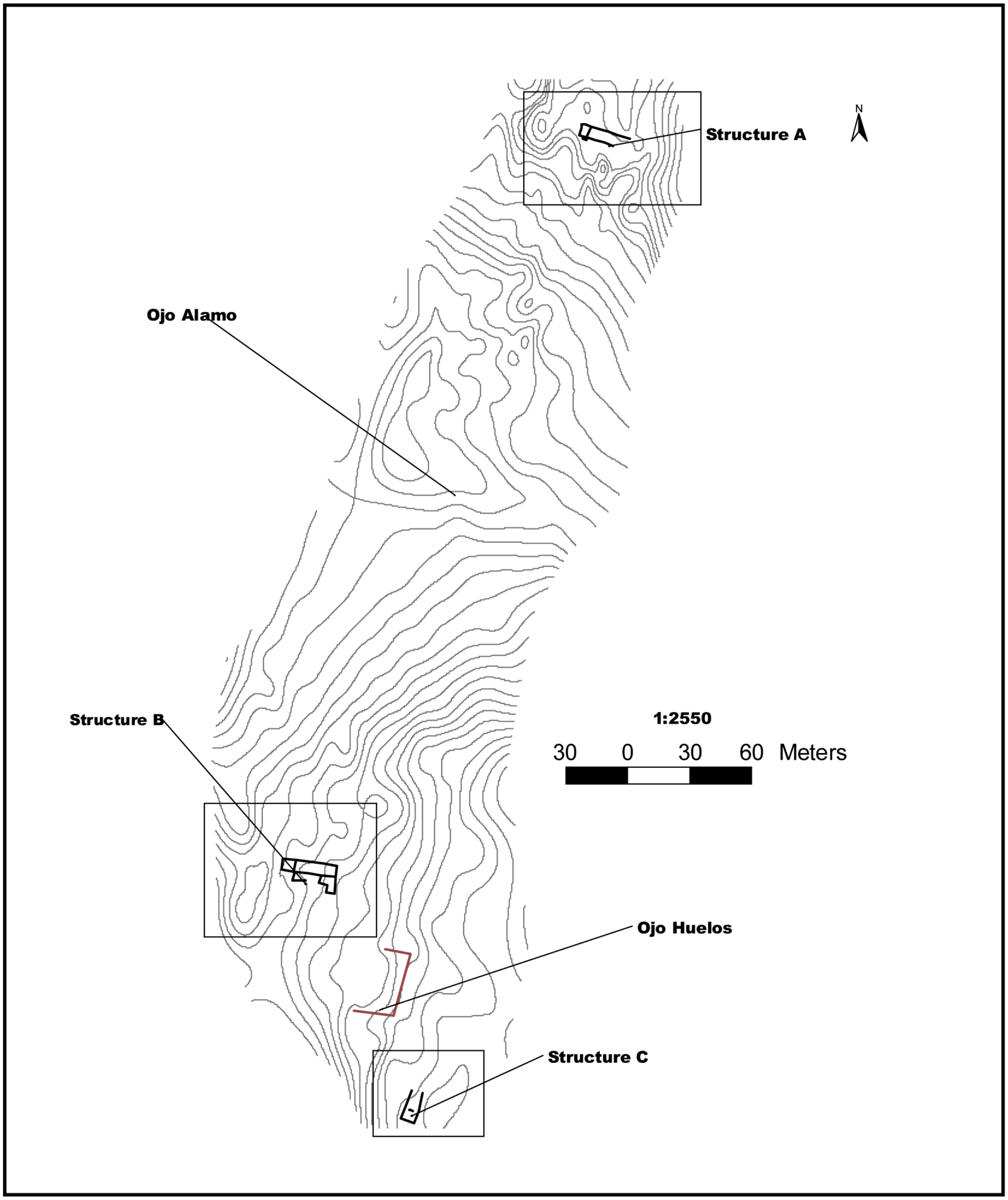


Figure 5. Topographic map of Comanche Springs. Prepared by Shawn Penman in 1999, as part of the project directed by Ann Ramenofsky.

General results of the archaeological work are summarized in a series of reports, papers and dissertations (Boyd 2000; Cox 1998; Dean 1999; Feathers 2000; Hood 1999; Milford 1996; Pinson 1998; Ramenofsky 1997, 1998, 1999, 2010; Ramenofsky and Vaughan n.d.; Ramenofsky et al. 2008; Ramenofsky et al n.d.; Vaitkus 1999.; Vaughan n.d., 2006, 2017). The artifacts and paper records from the project are curated in the Maxwell Museum, and most are provided elsewhere in this report by Lou Schuyler; accordingly, in-text citations are used only minimally in this chapter.

In 1996, we began the general topographic map of the site (Figure 5), "faced down" (cleaned) a small section of the cut bank along Structure A, established 10 profile units in that area, created a site grid, collected flotation samples, and began excavating using 1/16 inch (1.6 mm) mesh screens (later changed to 1/4 or 1/8 inch [3.2 or 6.4 mm] mesh). Artifact samples were collected from three units and one feature was documented (Ramenofsky 1997:1).

In the summer of 1997, we completed the topographic map and excavated in and around Structures A and C. At the time, the footprints of both buildings were visible. No middens were discovered, nor was there evidence of Spanish farming (i.e., acequias or other types of water control structures) (Ramenofsky and Vaughan n.d.:8). Finally, nothing was discovered to support Hibben's claims that the site was an Oñate outpost in the early 1600s. During that field season, David Love of the New Mexico Geological Survey and Homer Milford from the Abandoned Mine Bureau examined the deposits (Ramenofsky 1998:2). Milford could not identify any reason for the selection of the site (Milford 1996).

In the summer of 1998, I spent about 20 days at the site with six paid crew members and two to four volunteers. The fieldwork included auger testing and excavation outside Structures A and C as well as inside the structures. Features were excavated as separate proveniences within the units in which they were found, albeit the features are identified by both feature number and excavation unit in the two Ramenofsky reports from 1998 (Ramenofsky 1998:4–5, Table 2).

Richard Hughes analyzed more than 100 obsidian samples using XRF to measure trace element concentrations and identified a number of sources (Chapter 6 and Appendix B). Samples from Obsidian Ridge (Cerro Toledo Rhyolite) and Cerro del Medio (Valles Rhyolite) were most common, but other sources including Government Mountain, Horace Mesa, and Canovas Canyon were represented (Hughes 2002; Ramenofsky 2007:3). Samples for dendrochronological analysis were submitted to Jeffrey Dean of the Dendrochronology Laboratory at the University of Arizona, but no dates were obtained (Appendix D).

Three dating methods were employed to bracket the Spanish occupation: archaeomagnetism, thermoluminescence, and radiocarbon. Only the latter two were successful. Brief summary reports by Darden Hood of Beta Analytic and James Feathers of the Luminescence Laboratory at the University of Washington are included in Appendix C and E respectively.

Table 2 summarizes the thermoluminescence results. Ten specimens including two pieces of slag and eight ceramic sherds were submitted to Feathers' laboratory. Of that total, six sherds were analyzed and produced dates. Five sherds came from within or adjacent to Structure C. Only one sherd derived from Structure A, Feature 55.

Table 2. Thermoluminescence Dating Results, Comanche Springs.
(* Unreliable dates due to anomalous fading)

FS No.	Material	Location	Luminescence Age	Range	Percent Error
265	Sherd, Biscuit B (highly burned)	Intramural C 2540 N 4928 E	1850 ± 15*	1865–1835*	10
238	Sherd, soup plate	Extramural C 2548 N 4930 E	1805 ± 34*	1771–1835*	17.4
219	Salinas Redware soup plate	Extramural C 2548 N 4930 E	1713 ± 27	1686–1740	9.4.
5117	Sherd, Salinas Redware soup plate	Intramural A 3012 N 5028 E Feature 55	1683 ± 32	1651–1715	10.1
237	Sherd, Salinas Redware soup plate	Extramural C 2548 N 4930 E	1666 ± 28	1638–1674	8.4
231	Sherd, Olive Jar	Intramural C 2540 N 4926 E	1655 ± 28	1627–1683	8.3
110	Slag	Extramural C 2549 N 4931 E Feature 3	Not datable		
153	Slag	Extramural C 2549 N 4931 E	Not datable		
222	Sherd, glaze with white slip	Extramural C 2548 N 4930 E	Not datable		
225	Sherd, Salinas Redware soup plate	Extramural C 2548 N 4930 E	Not datable		

Four of these sherds produced reliable estimates suggesting that the settlement was occupied between A.D. 1655 and 1713. Also of interest, the mean estimates of the two definite post-contact sherds, Nos. 5517 (from a Salinas Red soup plate) and 231 (from an olive jar fragment) fall within 30 years of each other in the middle to late seventeenth century (1683 and 1655 respectively)

Two radiocarbon samples were submitted to Beta Analytic (Table 3). One sample, UNM307, derived from a charcoal-filled pit beneath the Spanish occupation in Structure C. This sample likely derives from precontact Native American use of the area. The 2 sigma calibrated estimate for this pre-Spanish use was A.D. 1295–1450. The other sample, UNM5055, was from a burned roof timber found inside Structure A. The results included four intercepts but the most probable 2 sigma calibrated date range was A.D. 1615–1680. This estimate is compatible with the reliable luminescence estimates. The current evidence thus suggests that the Spanish occupation of Comanche Springs dated from the mid-seventeenth century through the Pueblo Revolt and into the early eighteenth century.

Table 3. Radiocarbon Dates, Comanche Springs.

FS No.	Beta No.	Provenience	Measured C14 Age	Calibrated Date	Comments
307	B-123695	2540N 4926E, Structure C FLVL 6 88 cm BD2	490 ± 60 BP	1295–1410 (2σ)	Pit feature (Feature 10) below floor. See Feature descriptions, below, and Table 5.
5055	B-133651	3014N 5028E, Structure A UL 4 36–40 cm BD1	220 ± 50 BP	1510–1595, 1615–1680 1740–1805 1930–1950 (2σ)	Ponderosa pine, part of a decaying roof timber. Tree-ring date not possible, so submitted for radiocarbon analysis. Located in cienega soil on a soup plate fragment.

Although the structures at Comanche Springs were clearly of Spanish design, there were indications that the residents included both Spaniards and Puebloans, including adult males, females, and children. The ceramic sample included majolica and olive jar fragments, but native ceramics and colono wares were far more common. In addition, the flaked stone sample was clearly of Pueblo origin. The nature of the interaction between these two groups is not known, but I discovered no evidence that the native peoples were slaves, whether chattel or kin based (Ramenofsky 2010; Ramenofsky and Vaughan n.d.:2). The native residents at Comanche Springs may have migrated from the Salinas towns or villages. Those places are the closest to the site and were abandoned by their Puebloan residents during the Spanish occupation of Comanche Springs.

Structure A

At the time of our exploration of Comanche Springs, there were no standing walls at Structure A; the footings were thick (double coursed at a minimum) and made of adobe. These attributes suggest that the building was designed (and perhaps built) by Spaniards. The current east-west wall stubs measured only about 16 m long (Figure 6). Initially the structure had been longer, but arroyo cutting at the east end of the structure had removed enclosing walls. Our best estimate of the total original length was 25 m. The building was about 6 m wide.

Excavation units within the structure ranged in size from 0.5 to 2 m square. All fill was screened through 1/8 inch (3.2 mm) mesh. Eleven units were excavated to an average depth of 40 to 50 cm, ending more or less in the cienega soils. Multiple features were documented within our excavation, being densely concentrated along the east edge or eroding margin of the structure. Features included sections of burned roof beams, piece of mold-made adobe bricks, and evidence of domestic activity. Outside the structure, 17 auger tests were placed. Although a few artifacts were encountered, no feature or metallurgical debris was documented from these tests.

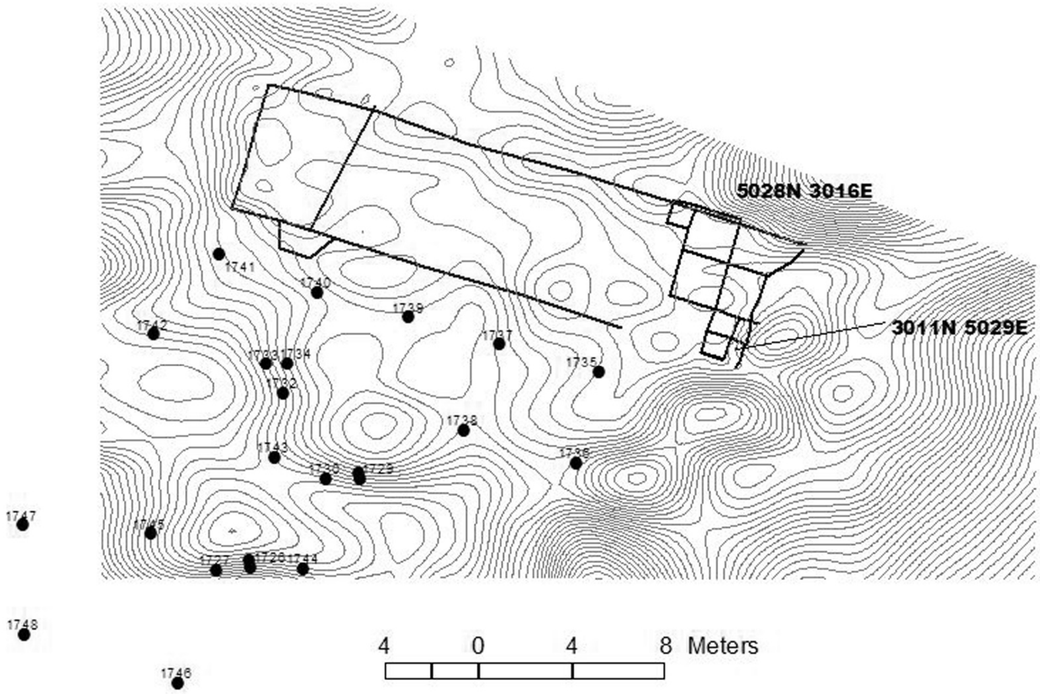


Figure 6. Structure A, showing extramural auger tests. North is to the top of the page.

Structure C

Structure C was smaller than Structure A, 15 m long by 7 m wide (Figure 7). Like Structure A, the footings of Structure C were massive, double coursed, and apparently of Spanish design. A small wall separated the building into two sections.

Previous excavation had caused considerable disturbance of Structure C. As a result, only seven units were excavated within the structure, using the same strategy as in Structure A. The original building may have included a tower. One prepared floor was encountered in the structure, and one charcoal-filled feature (Feature 10) lay stratigraphically below the floor. As is detailed above (Table 3), charcoal from this pit produced a two sigma calibrated radiocarbon date of 1295–1410. Outside the structure, 37 auger tests were placed and three metallurgical features were excavated. Additional metallurgical debris was found in a number of pits. The excavations exposed evidence of three episodes of use at Structure C. The earliest use episode took place about a century before Spanish contact. The middle episode was the Spanish occupation of Structure C. After Structure C was abandoned, others used the structure for a short time, perhaps as an animal pen.

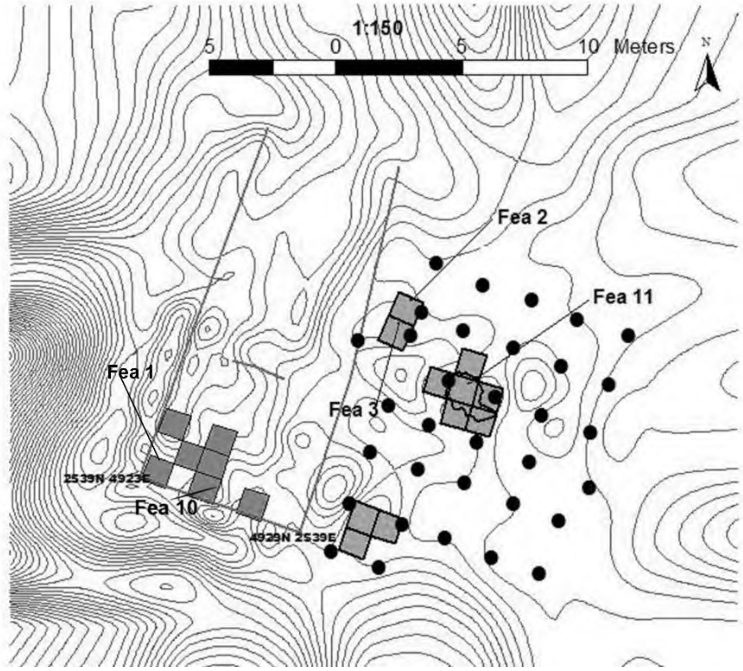


Figure 7. Structure C, showing features, units, and auger tests.

Features

In the field we were conservative about identifying and excavating features, due to two factors: the previous excavations (and the disturbance caused by that activity) and our lack of familiarity with the site. In the field, features were defined as part of a structure or any material that differed from the surrounding sediments, artifacts, or structure. During analysis, features were redefined and limited to units or parts of units that were different than the surrounding matrix or artifacts. This redefinition resulted in a total of 13 features, eight from Structure A (Features 50–57) and five from in and around Structure C (Features 1–3, 10, and 11) (Tables 4 and 5). In the final list, all Structure A features were located within the structure itself.

Metallurgical Evidence

As is summarized in Vaughan's dissertation and a paper by Ramenofsky et al. (2008), pre-Revolt Spanish Colonial period metal mining is poorly documented. At the time of our Comanche Springs fieldwork, only four pre-Revolt sites with metal production were known, and two of those facilities were in Pueblo communities. This fact added to the significance to the Comanche Springs record, establishing one of the goals of the research. All potential metallurgical evidence, including features, slag, metal, burned adobe, and bloated ceramics, were given a high priority in discovery and analysis.

Table 4. Features at Structure A.

Fea. No.	Feature Provenience	Unit Provenience if Different than Feature	Feature Level	Unit Level	Elevation (M.cm)	Description
50	3014 N 4030E		1		1646.18	Adobe Brick. Directly above Feature 55.
51	3015 N 5028.5 E	3016 N 5028 E	1	4	1646.18	Adobe brick. Associated with possible evidence of burning.
52	3014 N 5030 E		1–3	4	1646.03	Post hole. Associated with Feature 50.
53	3016 N 5028 E		1	5	1646.08	Possible post hole associated with rocks.
54	3012 N 5029 E	3011 N 5029 E and 3012 N 5029 E	1	6	1645.93	Line of 17 small stones (including 2 comal fragments) extending N–S in 2 rows. Set into compact adobe. The feature extended across 2 units.
55	3011.9 N 5028.58 E	3011 N 5030 E and 3012 N 5029 E	1–3		1645.93–1645.91	Below Feature 54 and extending into 2 units. A concentration of trash below which was a small buried pit that included half a soup plate (FS 5117, dated by TL; Table 5) and four small humpback adobe bricks with lime plaster and an iron oxide coat.
56	3011N 5029 E		1–2		1645.99–1645.91	Compact adobe including the lip-like edge of Feature 55.
57	3012 N 5029 E	3011 N 5029 E and 3012 N 5029 E	1		1645.94	Burned adobe with ash and an adobe brick.

Table 5. Features at Structure C.

Fea. No.	Feature Provenience	Unit Provenience if Different than Feature	Feature Level	Description
1	2540 N 4924 E Intramural		1–3 Total of 20 cm	Dark sediment with fist-sized cobbles, fire cracked rock. Most likely a small patch of intact midden in an otherwise disturbed unit.
2	2549.22 N 4930.97 E Extramural		Levels 2, 4–7	Pit first exposed in south profile of unit. Dark, ashy soil with slag, air-chill spatter, and hammer scale. See section on metallurgy and Tables 6 and 7.
3	2549.22 N 4930.97 E Extramural		Levels 1–7	Pit along west wall of unit. Dark, ashy soil with metallurgical debris pit that was filled with hammer scale and air-chill spatter. See section on metallurgy and Tables 6 and 7.
10	2539.1 N 4925.2 E Intramural	2540 N 4926 E	Level 1, elev. 1653.49 m	Charcoal filled pit beneath the Spanish occupation floor. Fill used to establish a radiocarbon date. See Table 3.
11	2547 N 4934 E Extramural	2548 N 4934 E 2547 N 4933 E 2547 N 4934 E 2547 N 4935E 2546 N 4935 E	3 levels (total of 30 cm)	Shallow, metallurgical feature that extended across five excavation units. Showed evidence of extreme burning. Metallurgical debris present. SEM analysis of slag sample FS305. See Table 7.

Metallurgical features and debris were primarily confined to Structure C and to areas east of that structure (Table 6). Within the structure, only occasional pieces of slag were recovered, but higher concentrations of slag along with metallurgical features (Nos. 2, 3, and 11) were encountered east of the structure during auger testing. In these features, pits, sediments with a deep orange-red hue, charcoal, ash, and slag were found. Based on this evidence, Vaughan believed that Structure C was used for a different aspect of the metallurgical process than took place in and next to Structure B. In an unpublished manuscript, Ramenofsky and Vaughan suggested that the Scholle District at the south end of the Manzanos was a possible source for the ore and metallurgical debris recovered from Comanche Springs. Information on New Mexico's historic mining districts was recently updated by McLemore and Lueth (2017), and in map form by McLemore (2017).

Table 6. Counts and Weight of Metallurgical Slag by Structure.

Structure	Slag Count	Slag Weight (grams)	Metal Count	Metal Weight (grams)
A	12	61.20	0	0
C	997	3178.96	218	223
Total	**1009**	**3240.16**	**218**	**223**

All metal products and by-products were first processed in a lab, where they were separated by type (slag, metal, prill, air chill spatter, and hammer scale) and weighed (Ramenofsky 2007:2). Because extramural pit Features 2 and 3 appeared to have fine metallurgical fragments indicative of iron forging, the flotation samples were subjected to a special analysis described below. Some larger pieces of slag were analyzed by Vaughan in his dissertation, using scanning electron microscopy or SEM (Vaughan 2006). The sample included three pieces from Hibben's excavation (noted with a B in Table 7); the other pieces were from the excavation described here. As is noted in the table, the SEM results suggest that iron smithing or forging was a common activity in or next to Structure C (Ramenofsky 2007:3). Bloomery processing was common in the mining of base metals such as iron, copper, and lead (Vaughan 2006:209).

The protocol for isolating air chill spatter and hammer scale involved sieving flotation samples through a nested set of geological sieves, followed by trawling of sieved samples with a pencil magnet to recover very small pierces. Flotation sample weights varied from less than 500 grams to more than 10,000 grams. Average weight per sample was about 2500 grams. Results were quantified as percent weight of sample size, with metal weight separated from non-metal weight. The process was labor intensive but rewarding, as abundant evidence of iron forging byproducts was recovered.

Table 7. Metallurgical Items Analyzed by Scanning Electron Microscopy.

FS Nos. or Artifact ID	Provenience	Description
FS 171	2541 N 4925 E Intramural, not in feature	Copper production debris
FS 173	2544.22 N 4930.97 E Extramural, in Feature 2	Iron slag, possibly from bloomery
FS 283	2541 N 4933 E Extramural, not in feature	Iron bloomery slag
FS 305	2547 N 4934 N Extramural, in Feature 11	Furnace or forge fragment; possibly part of bloomery furnace
Structure B, No. 1*		Forge floor
Structure B, No. 2*		Ore of iron and lead (gossan)
B6577*		Wood ash, soil reaction product

*Samples collected by Hibben.

Table 8 summarizes the results of part of this analysis. Features 2 and 3 had hammer scale or air-chill spatter with amounts ranging between 1 and 6 percent of total weight per sample. Although still a tiny fraction of the initial sample weight, these percentages are much larger than those for Feature 11. In that feature, as Table 8 shows, the weight values for iron forging fragments were 1 percent or less. The trawling process was discontinued for Feature 11. Thus, the evidence indicates that of the three features, only Features 2 and 3 were related to iron forging.

Comparison of Field Projects

There is no question that Comanche Springs was a significant place during Spanish exploration and settlement in the 16th and 17th centuries. Very few pre-Revolt Spanish sites are well-documented in the colony, and even fewer have evidence of metal production. Despite differences in goals, field strategies, and laboratory analyses, the consensus between these two projects regarding a pre-Revolt Spanish presence cannot be doubted.

Hibben suggested that Comanche Springs was a hierarchically organized Spanish "mining camp" directed by Juan de Oñate. In his scenario, Pueblo peoples were slaves serving the Spanish-owned mines. Hibben further believed that metal production was focused on extraction of gold and silver. We found no evidence to confirm these ideas. The dates we obtained point to a later occupation than Hibben supposed, and nothing was discovered to suggest an hierarchically organized mining camp with Native slaves. While metal production, especially iron working, was present, metallurgy appeared to be only one aspect of community life. Comanche Springs was a short-lived hybrid community dating to the mid-seventeenth century to the early eighteenth century. In other words, the community was occupied shortly before and perhaps also after the Pueblo Revolt.

Table 8. Partial Sieving Results for Identifying Air Chill Spatter and Hammer Scale, Features 2, 3, and 11.

FS No.	Unit	Fea. No.	Level	Weight Grams (Non-metal)	Weight Percent (Non-metal)	Weight Grams (Metal)	Weight Percent (Metal)
150	2549.22 N 4930.97 E	2	2	233.43	97.54%	5.74	2.49%
175	2549.22 N 4930.97 E		4	380.67	97.35%	10.09	2.7%
180	2549.22 N 4930.97 E		5	1836.04	96.86%	57.66	3.14%
182	2549.22 N 4930.97 E		6	457.42	96.73%	14.98	3.27%
184	2549.22 N 4930.97 E		7	464.57	97.22%	12.9	2.78%
100 and 151	2549.22 N 4930.97 E	3	1	2224.2	94.5%	121.1	5.5%
152	2549.22 N 4930.97 E		2	2513.7	94.78%	136.4	5.22%
163 and 179	2549.22 N 4930.97 E		3	3603.0	96.5%	133.1	3.6%
235	2549.22 N 4930.97 E		4	14068.8	98.94%	149.42	1.06%
247 and 253	2549.22 N 4930.97 E		5	2458.3	96.3%	90.8	3.7%
316	2547 N 4934 E	11	2	10616.6	98.95%	111.35	1.05%
314	2547 N 4934 E		3	6507.3	99.06%	61.25	0.94%

There is much about Comanche Springs that remains to be understood. The metallurgical evidence is especially significant. The recently accessioned metallurgical debris (including both slag and metal objects) from Hibben's field work should be fully analyzed. This substantial expansion of the analyzed sample would increase our knowledge of ore sources, the smelting process, and the metallurgical goals of the residents at the settlement.

In addition, research regarding why Comanche Springs was selected as even a short-term residence ought to be pursued. Comanche Springs was isolated from both the Camino Real and the Spanish settlements along the Rio Grande. Was this community associated with the Spanish presence at the Saline missions, or was the isolation deliberate, insulating residents from the

Spanish civil authorities? Both explanations are possible. And what about agricultural production? Although the springs made the setting attractive for habitation, neither project discovered evidence of agricultural features. Is there yet-to-be-discovered evidence of such features? Finally, the nature of the interaction between the Spanish and Pueblo residents needs to be more fully explored. The size of the houses suggests that the Spanish contingent was relatively small—perhaps three or four extended families? But what about the native residents? With this report as a baseline, it may be possible to move our understanding of Comanche Springs forward.

Chapter 4

HIBBEN'S EXCAVATIONS AT METZLER RUIN

In 1975, during the same period that Hibben's 12 "veterans" of UNM excavations excavated Comanche Springs, they also excavated a site identified as a fortified Spanish hacienda, Metzler Ruin (Figure 8). The site is east of the Tomé Land Grant, on Forest Service land (Hibben apparently thought that he was on private land when he dug there). The site is at the mouth of Comanche Canyon (at the base of the Manzano Mountains), across an arroyo from a substantial perennial spring. Today the spring is piped and provides the water for Metzler Ranch.

Hibben excavated Metzler Ruin to expose its plan and general stratigraphy, and claimed to have left two-thirds of the fill for future excavations (Hibben et al. 1985:44). He reported "fortified" corrals at the site (Hibben et al. 1985:45). The excavations were not backfilled and were still obvious as of 2015 (D. Phillips, personal communication 2018). Adler concluded that Metzler Ruin was later than the three buildings identified at Comanche Springs, based on the pottery (Hibben et al. 1985:66).

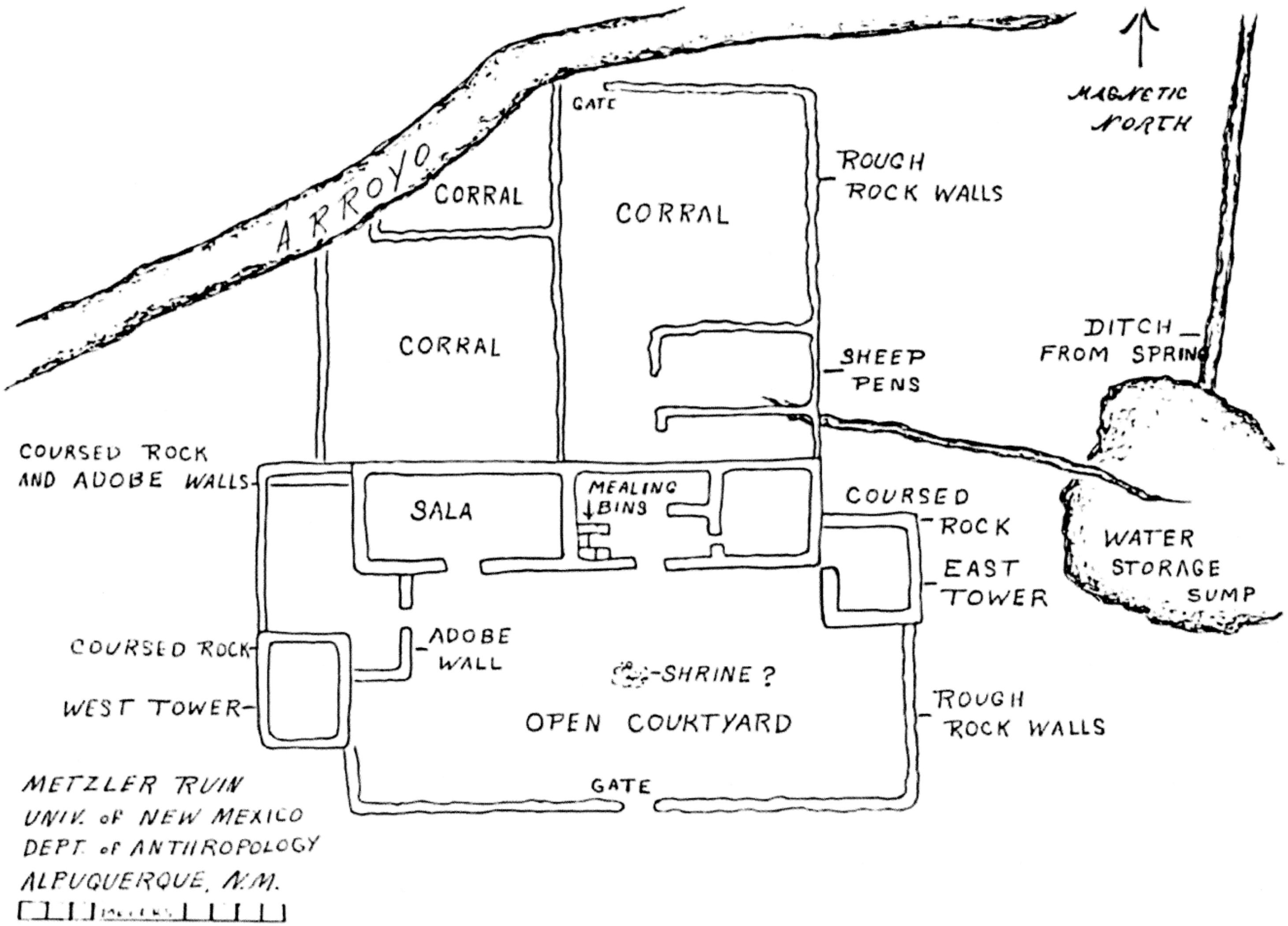


Figure 8. Metzler Ruin. Source: Hibben et al. (1985, Figure 6).

Chapter 5

THE COLLECTIONS

Comanche Springs Artifacts

Accession numbers for Comanche Springs artifacts in the Maxwell Museum collections are shown in Table 9. Discrepancies between the nominal sizes of collections and the numbers of objects physically residing in the collections are described below where possible.

Table 9. Comanche Springs Accessions.

Accn. No.	No. of Artifacts in Collections	Excavation Dates	General Proveniences
Hibben's Excavations			
51.2		Ca. 1950	
95.20			
2005.68	1		Comanche Springs
2007.8	22,900+	1973–1977, 1987	Pueblo B, Rooms 1, 2 ,4, 5 and Pit West Structures A, B, C Area 7 Bison Bed
2015.3	40,600+	1960, 1970, 1972–1977, 1980	Comanche Springs
Ramenofsky's Excavations			
2006.113	5,400+	1990s	Comanche Springs
2011.96	1	1990s	Comanche Springs

The Comanche Springs Artifact Catalogue or CSAC (an Excel spreadsheet) includes artifacts in the Maxwell Museum collections or otherwise known to have existed, and may be obtained from the Maxwell Museum. The catalogue includes the known information about the artifacts collected. The spreadsheet includes a Hibben tab and a Ramenofsky tab for their respective sets of data. Appendix A includes definitions of the data elements.

Artifacts from Hibben's Excavations

"Early Man" artifacts excavated by Hibben and George Agogino were catalogued under Accession No. 51.2. Seventeen artifacts (51.2.1–17) are described in the Maxwell Museum's old "Blue Book" records. The location of these artifacts is unknown.

Some bison bed and Spanish Colonial artifacts excavated by Hibben are documented as being in Accession 95.20, but I found no description of these artifacts. The Maxwell Museum warehouse holds large bones in plaster casts (David Phillips, 2015 personal communication) that are not marked but may have been intended to be part of accession No. 95.20. Otherwise, the number and location of these artifacts are unknown.

Artifacts from Hibben's excavations that are available at the Maxwell Museum collections include Catalogue Nos. 2005.68.1, 2007.8.1–520, 2015.3.1–198, 2015.3.200–253, 2015.3.255–360, 2015.3.400–758, 2015.3.760–767, 2015.3.769-1223, 2015.3.1236–1284, 2015.3.1286–1439, 2015.3.1442–1641, 2015.3.1643–1669, 2015.3.1684–1883, and 2015.3.1900–2113.

At the time of this writing, artifacts in Accession No. 2015.3 have not been analyzed but are available for examination at the Maxwell Museum.

Artifacts from Ramenofsky's Excavations

Catalogue Nos. 2006.113.100–109, 2006.113.111–121, 2006.113.123–261, 2006.113.263–329, 2006.113.332, 2006.113.334–346, 2006.113.1000–1027, 2006.113.1029–1037, 2006.113.1039, 2006.113.1041–1055, 2006.113.5000–5123, 2006.113.5500, 2006.113.5501, and 2011.96.1 are from the Ramenofsky excavations. Results of tests and analyses performed on these artifacts were included in the catalogue when possible.

The artifacts excavated by Ramenofsky and included in 2006.113 from Comanche Springs are associated with the greatest amount of detailed information. These, along with the artifact (Catalogue No. 2011.96.1), are available for examination at the Maxwell Museum.

Metzler Ruin Artifacts

All excavations at Metzler Ruin were led by Frank Hibben. Metzler Ruin artifacts located in the Maxwell Museum collections include Catalogue Nos. 2007.75.1–212. The artifacts are listed in a Metzler Ruin Artifact Catalogue (an Excel spreadsheet) available from the Maxwell Museum. Appendix A includes definitions of the data elements.

I located an Excel spreadsheet, for Accession No. 2007.8, that appears to be an earlier attempt to create a Metzler Ruin catalogue. However, that spreadsheet commingled Metzler Ruin and Comanche Springs artifacts.

Documents

Documents relating to Comanche Springs and Metzler Ruin are in the Maxwell Museum archives but are only partly organized. I have created a draft document catalog (in the form of an Excel spreadsheet) for each site. They remain drafts because some documents have no accession numbers. Also, while I provide basic descriptions of the documents, a more thorough review of each is needed. Both the Comanche Springs and Metzler Ruin document catalogues are available from the Maxwell Museum archives. Some of the documents in the catalogues had not been recorded in official Maxwell Museum records as of this writing. Additional documents are listed in the Bibliography; some may simply provide contextual information for Comanche Springs and Metzler Ruin.

Documents from Hibben's Excavations at Comanche Springs

Several Comanche Springs draft documents exist in multiple versions. They include field school student notebooks, reports that may have been prepared by students, several completed reports, descriptions of scientific analyses, professionally published articles, maps, photo records, and letters.

I found 30 student notebooks (Catalogue Nos. 78.42.17–.39, 95.29.351–357, and one notebook without a catalogue number); the names of the students are not provided due to FERPA. Based on the dates, these notebooks are from the Hibben excavations. Notebook 78.42.26 is dated 1970 and addresses sections 450–464N at 80W. Notebook 78.42.29, dated 1971, addresses squares M5, L6, K6, and J4. Five notebooks (78.42.33–.36 and 78.42.38), dated 1971, address loci designated "SST-1-5" areas around the bison bed (squares H3–H5, I3–I6, J3–J7, K3–K8, L3–L9, M3–M9, N6–N9, O7–O9, P7–P9, Q8, Q9, R8, and R9; and a pueblo). Notebook 78.42.38 also includes a list of artifacts and a mileage log indicating that excavations were underway from June 7 through August 5, 1971. Notebook 78.42.37, dated 1971, contains lists of artifacts and some excavation information. Five notebooks (78.42.27, 27.42.28, and 78.42.30–32) are dated 1973 and address areas described as Pit West, East Trench, North Area, East/Eastern Trench Triangle, and Bison Beds. Two notebooks (78.42.19 and 78.42.20) are dated 1973 and address sections and squares Q6, Q7, P7, P8, R8, 1250E/160N, and 1215E/175N. Notebook 78.42.25 is undated and addresses sections O7–O9, and P7. Two notebooks (78.42.39, dated 1973; 78.42.23, undated) address Hearth Site No. 1. Four notebooks (78.42.17, 78.42.18, 78.42.21, and 78.42.22) are undated and contain lists of artifacts. Notebook 78.42.24 is undated; it contains a number of sketches of angles and calculations (this may have been a notebook used by Ben Benjamin during his mapping). Three notebooks (95.29.351, 95.29.352, and 95.29.354) outline excavations of Structure B and Pit West in 1976 and include lists of artifacts, artifact sketches, and drawings of Structures A, B, and C. Four notebooks (95.29.353 and 95.29.355–357) contain a variety of notes (some from reports students were reading) and include sketches and maps. Of these three notebooks, one (95.29.353) was dated 1976. The undated notebook without a catalogue number listed artifacts from N5, N6, M5, and M6.

I also found what appear to be field notes removed from a spiral notebook (95.29.358, dated 1974), addressing Pueblo B, Structures, and Refuse West (Pit B). The mix of handwriting suggests that this set of notes was prepared by several students. Similarly, 95.29.361 contains a mix of field notes from 1972 and Daily Unit Excavation forms from 1973, from a variety of locations including the bison bed and the East Trench Triangle area.

Daily Unit Excavation forms dated 1974 (Catalogue No. 95.29.362) provide excavation details.

Documents from Hibben's Excavations at Metzler Ruin

Documents for Metzler Ruin were far fewer in number. They included 14 sets of field notes, a map, forms identifying artifacts, and a 1976 faunal analysis report by John W. Olsen. The Metzler Ruin document catalogue numbers are 96.5.1–17.

Documents from Ramenofsky's Excavations at Comanche Springs

Documents from the Ramenofsky excavations include the results from a variety of technical and scientific analyses (some by professionals, others by students involved in the excavations). I am aware of three documents by Ramenofsky ("Summary: Comanche Springs Test: 11/8–11/10/1996"; "Excavation Summary: LA 14904, Comanche Springs, 9/1/98"; "Exploring the Nature of Hybrid Communities in 17th Century New Mexico: Comanche Springs") that I did not find in the Maxwell Museum archives. I included copies of these three draft documents in the Original Data electronic folder (available from the Maxwell Museum of Anthropology), which contains data and documents I used in preparing the artifact and document catalogues for both Comanche Springs and Metzler Ruin. Ramenofsky presented "Exploring the Nature of Hybrid Communities in 17th Century New Mexico: Comanche Springs" at a Society of Historical Archaeology symposium in January 2010; it is included as Appendix F.

Photography

The Maxwell Museum's archivist will catalogue the Comanche Springs photographs, slides, and negatives as she organizes the other documents. I have not examined any of the photographic prints, negatives, or slides but was able to examine some digital images. Table 10 summarizes my notes on the Comanche Springs photo records and digital photos, from both the Hibben and Ramenofsky excavations (I did not know which photos came from which excavation). I turned over my digital photography information (in a folder named CS Photos, included in the Original Data folder) to the museum's archivist.

Table 10. Comanche Springs Photo Files.
(Source of items is Ann F. Ramenofsky, unless otherwise noted.)

CS Photos File Name	Description
Ramenofsky's Metadata	Ramenofsky's explanation of the available photos; dated 2/1/2011
Metadata	Another brief explanation of photos and the scanning process
Photo Log	Descriptions of color slides Nos. 1–136 and of color negatives Nos. CS 1–CS 36. Mentions slides identified as "CS-98+" which should be in the project documents.
Slides	A folder with 21 images
Negatives	A folder with 36 images
Correspondence Table	Provides link between slides and negatives as well as Northing and Easting values

Table 10. Comanche Springs Photo Files.

(Source of items is Ann F. Ramenofsky, unless otherwise noted.)

CS Photos File Name	Description
Scans of Photos	Descriptions of color negatives Nos. CS1–CS36, and of color slides Nos. 1–134
Photo Catalog	List of about 170 photos with some descriptions
Spanish Colonial Cup	Two views of a ceramic cup, by Karen Price.
power_point_slides_cs	Miscellaneous maiolica and olive jar sherds

With one exception, Ann Ramenofsky provided the electronic records summarized in Table 10. The exception was two images of a Spanish Colonial period cup, used in Figure 9. Additional images of the cup are available from the Maxwell Museum archives.

Table 11 provides the descriptions for most of the color slides (some were not described in the Photo Log folder listed in Table 10). Because the photographic collections from Comanche Springs are not yet organized, it was not possible to reconcile the various lists of photos, negatives, and physical photographs. I am able to confirm that color slides and negatives exist, that photos were developed and printed, that some photographs were scanned, and that a paper log and a digital log were created (using different numbering schemes) (Ann Ramenofsky, 2018 personal communication).

The set of slides mentioned as "CS-98+" in Table 11 is described in the Ramenofsky's Metadata folder as a third set of slides numbered 170 to 301. Boxes marked Comanche Springs are present in the Maxwell Museum photo archives (Diane Tyink, 2015 personal communication) that may include the physical slides, negatives, and photos mentioned in Table 10.

I was unable to document the existence of any photographs taken of Metzler Ruin during Hibben's excavations.

Figure 9. Two views of a Spanish Colonial period ceramic cup. Photographs by Karen Price. Cup catalogue number is 2015.3.301.

Table 11. Description of Comanche Springs Color Slides.

(From photolog.xlsx file. Source is Ann Ramenofsky unless marked with an asterisk.)

Slide No.	Description
1, 2, 6, 17	Structure C, excavation
3	Structure A, excavating burned roof beam
4	Structure C, surface rock
7	Structure A, block excavation
8	Looking E from Structure C, Manzano Mountains in background
9	Structure C, clearing surface
10	Structure A, burned roof beams; burned soil
11, 12, 28	Structure A
13	looking SE toward Structure C at modern springs
14, 118, 122, 126, 130	Structure C, general view
15	Structure C, looking south
16, 19, 20	Structure C, extramural excavation
18	Structure C, Feature 1 with exposed adobe below
21	Pecos striated ceramics
22	Salinas Red, non-traditional bowl
23	Tabira Black-on-white jar
24	Obsidian flaked stone
25	2 ring bases—ceramics
26	Salinas Red bowl
27, 31	Tabira Polychrome
29, 33	Ceramic figurines, horse, small jar—possibly Spanish
30	Soup plates with glaze
32, 36, 125, 129	Crew
34	Salinas Red soup plate
35, 37, 38	Tabira black-on-white jar, kachina fragment on surface
39, 64	Soup plates
40*, 51*, 59*	Lead disks (recycling), from Hibben
41*	Slag, prill, and metallic mineral
42*	SEM results table
43, 70, 73, 107, 110	Soup plate fragments
44, 48, 63	Slag
45	SEM micrograph of broken prill, some silver present
46	Table, sorting protocol
47	Glaze paint refit (3 sherds)
49	SEM micrograph, prill sample No. 3, spot 4, iron sulfate
50	Graphic: trawling table
53	Graphic: dates from Comanche Springs
54	SEM micrograph, close up of copper sulfide on wood?
55	SEM micrograph, copper sulfide plan view
56	Graphic: radiocarbon and luminescence dates—table
57	Graphic: results of trawling—histogram
58	Map, topography
60, 106, 115	Metallurgy: iron slag from Feature 10; thin section, No. 26 (curated with San Marcos thin sections)

Table 11. Description of Comanche Springs Color Slides.
(From photolog.xlsx file. Source is Ann Ramenofsky unless marked with an asterisk.)

Slide No.	Description
61, 67, 68	Ground stone, comal fragments
62	Ground stone, cooking pot fragment
65, 69	Bowl, exterior Glaze F
66, 71	Olive jar fragments
72, 74, 75	Majolica fragments
76	Metallurgy: 2 slag, 1 prill, 1 metal, 1 mineral
77	SEM micrograph. prill, broken vesicles, and homogenous
78, 85	SEM micrograph, unknown
79	SEM micrograph Sample 1: prill, dendritic structure from quenching
80	SEM micrograph Sample A: vesicle, copper blob
81	SEM spectrum, comparison of light and dark areas
82	SEM spectrum, sample A, - bubble inside vesicle—lead sulfide
83	SEM sample, iron oxide coat on prill with 10µ of silver
84	SEM sample A, light area, rock minerals, lead
86	SEM sample B, slag incompletely melted
87	SEM sample 3, > 25µ prill iron oxide coat, byproduct of heating
88	SEM spectrum, copper sulfide blob, pure, processed
89	SEM sample B, spot 4, silicate, quartz
90	SEM sample B, spots 1, 2, 3 (3 = quenching)
91	SEM sample B, spot 7, “cubes”
92	SEM spectrum, cubes of sample B, spot 7, magnetite or iron “spinal”
93	SEM spectrum, sample B, spot 3, fosterite or fayalite
94	SEM spectrum, copper sulfide
95	SEM spectrum, sample B, spot 5, Aluminum silicate
96	SEM spectrum, sample “B-ZR-heavy,” persistent metal
97, 101	Grooved metal
98, 102, 109, 113	Ceramic, human face, effigy, “digit” (all from same artifact)
99, 103	Rim–neck sherds
100, 104, 114	Adobe brick section, close-up; Feature 55
105, 111	3 refitted ceramic pieces
108, 112	Small humpback adobe bricks; Feature 55, level 3
117	Structure C, wall collapse
119	Feature 3, cross section
120	Copy of Hibben slide: aerial view of Comanche Springs arroyo
121	Structure C with mesquite
123	Structure C, Feature 1
127	Arroyo cutting through Structure A
128	Graphic locator map
131	Excavation profile; taken in 1996
132	Plan map of slag areas, Structure C
133	Extramural shovel test pits with flags; Structure C; looking SE
135	Same as No. 36 in digital log
136	Same as No. 32 in digital log
CS-98+	Slides are in a separate folder in the document archives.

Chapter 6

DATA SOURCES

This section of the report serves as a finding guide for researchers. It explains how the catalogues were created and points out challenges that researchers may encounter when dealing with the Maxwell Museum artifact collections for Comanche Springs and Metzler Ruin.

Ann Ramenofsky provided a number of electronic files that I used in creating the Comanche Springs Artifact Catalogue (CSAC), the Comanche Springs Document Catalogue, the Metzler Ruin Artifact Catalogue, and the Metzler Ruin Document Catalogue. The files included images, Word documents, and Excel spreadsheets created during her excavations and analyses of artifacts. She transferred some of the Excel spreadsheets to me using a Dropbox folder, while others were generated from an Access database. I will refer to data as obtained via the Dropbox folder or from the Access database and will also describe where a copy of the data can be found in the Original Data folder that I created. The Original Data folder files are available from the Maxwell Museum.

Creation of the two document catalogues and the Metzler Ruin Artifact Catalogue were fairly straightforward, and will be discussed first.

Comanche Springs Document Catalogue

Data I obtained from Dropbox/Data/Maxwell paperwork/excel/Comanche Springs Paper Archive.xls can be found under Original Data/Comanche Springs tab: Paper Archive. To create the catalogue, I started with this document list and added data for other documents that I located in the Maxwell Museum archives.

CS Photos, a folder within Original Data, is the Comanche Springs photography catalogue. It contains the original source files for all of the photography information I located. Table 10 is an edited version of the original data in Dropbox/photo log.xlsx. There is definitely overlap among the data in these various files. At some future date the Maxwell Museum archivist will review the photography information, assign proper catalogue numbers and box and storage locations, and include the information in the Maxwell Museum archives database (Diane Tyink, 2015 personal communication).

The document catalogue contains one tab for documents associated with Hibben's excavations and another tab for documents associated with Ramenofsky's excavations.

Metzler Ruin Document Catalogue

As there was no electronic catalogue for Metzler Ruin documents, I created this catalogue by looking through the boxes of documents in the Maxwell Museum archives. At some future date, the Maxwell Museum archivist will assign proper catalogue numbers and box and storage locations and will include the information in the Maxwell Museum archives database (Diane Tyink, 2015 personal communications). All documents listed in this catalogue are from Hibben's excavations.

Metzler Ruin Artifact Catalogue

All excavations at Metzler Ruin were conducted under the direction of Frank Hibben. Data on the Metzler Ruin artifacts were taken from Dropbox/Data/Maxwell paperwork/excel/Metzler Ruin Hibben Artifacts.xls and can be found in Original Data/Metzler Ruin.

As the Maxwell Museum began organizing the Hibben collections from Comanche Springs and Metzler ruin, the collections were so commingled and poorly documented that Metzler Ruin was thought to be part of Comanche Springs (and was tracked using the LA number for Comanche Springs, LA 14904). After prodding from the USDA Forest Service, which owns Metzler Ruin, the museum recognized that the collections were from two sites and began designating Metzler Ruin materials by its proper site number, LA 103997. For most artifacts, the available provenience information made it possible to assign a given artifact to one site or the other. Many of the artifacts from Metzler Ruin were documented by excavators as being found in 1973. Hibben et al.'s (1985:43) comment on the timing of the Metzler Ruin excavation is in a paragraph discussing both sites as of 1975.

In reviewing the Comanche Springs artifacts that were repackaged using accession number 2015.3, I found that some of the proveniences were originally recorded by the excavators as Metzler Ruin. The Maxwell Museum data records indicate that during Hibben's excavations at Comanche Springs and Metzler Ruin, some of which overlapped in time, artifacts from Metzler Ruin were originally packed in boxes (now retired) numbered 6523, 6527, and 6536 through 6541. Because other boxes in the 6000 number series were also used to store artifacts from Comanche Springs, I reviewed all of the 2015.3 artifacts from retired boxes in the 6000 number series to check the recorded provenience and dates of excavation.

I used the following rules to assign artifacts from the 2015.3 Comanche Springs accession number to the correct site. Those assigned to the Metzler Ruin collection now have Catalogue Nos. 2007.75.184–2007.75.212.

1. Artifacts whose recorded provenience was Metzler Ruin were assigned to the Metzler Ruin collection regardless of the excavation date. This included the items formerly in boxes Nos. 6523 and 6527 as well as one artifact, found in Box No. 4793, that was marked MHA. One artifact bag from Box No. 6524, containing bones that were marked "MR," was assigned to the Metzler Ruin collection. Proveniences or comments beginning with MH relate to Metzler Ruin (David Phillips and Caroline Gabe, 2015 personal communication).

2. Artifacts with a valid Comanche Springs provenience remain in the Comanche Springs collection regardless of the associated old box number in the 6000 series. Proveniences beginning with "PB" correspond to Pueblo B (later designated Structure B) and those

beginning with 11- correspond to buildings at Comanche Springs (David Phillips and Caroline Gabe, 2015 personal communication). These artifacts included items from three bags (from former boxes 6529 and 6535) with a Structure provenience, artifacts (from former boxes 6511–6522, 6524–6526, 6528, and 6529) with an excavation date of 1960 but no recorded provenience, and items from one bag from former Box No. 6551.

3. Artifacts with an excavation date other than 1973 or 1975 and no provenience were assigned to the Comanche Springs collection. They include items from a bag marked with an excavation date of 1960, not marked MR" but from former Box No. 6523.

4. Two artifacts from former Box No. 6520, marked "San Luis Mission," may have been acquired during a field trip. They were removed from the Comanche Springs collection and catalogued as coming from LA 774, Sevilleta Pueblo.

5. Artifacts in bags from former boxes 6535 and 6551 with no excavation date, and with a provenience of ETT (East Trench Triangle), were assigned to the Comanche Springs collection because some of the documentation indicates that ETT was in or near the Bison Bed.

6. Two artifact bags from former Box No. 6535 (not a Metzler Ruin Old Box number) with no excavation date, and with a provenience of "Backhoe Finds," were assigned to the Comanche Springs collection. A comment was added to their entries in the CSAC that they might instead be from Metzler Ruin and that they should not be used in site-oriented research.

7. One artifact bag with no excavation date has a provenience that indicates it is from ETT or the Bison Bed. It was assigned to the Comanche Springs collection since both of these proveniences are at Comanche Springs.

8. A series of artifacts with no excavation dates and no proveniences were assigned to the Comanche Springs collection because they were marked with numbers beginning with "22-" (used by Hibben to indicate flaked stone artifacts). These old numbers are listed in documents (Catalogue No. 95.29.348) that describe each artifact including its locus, material, and dimensions and identify the proveniences as being at Comanche Springs.

I also reviewed the Hibben artifacts from former boxes in the 6000 number series that were assigned to accession 2007.8 by Ann Ramenofsky during her work on the site. I used the following rules to reassign artifacts from 2007.8. to the correct collection.

1. Artifacts from former boxes in the 6000 number series with valid Comanche Springs proveniences were assigned to the Comanche Springs collection.

2. One artifact bag, marked "Majolica," was assigned to the Comanche Springs collection because no Majolica ceramics were reported from Metzler Ruin.

3. One artifact bag was marked with a number beginning with "11-", a Comanche Springs location, so was assigned to the Comanche Springs collection.

4. Two artifact bags with 1975 excavation dates, were assigned to the Comanche Springs collection because the only excavation year marked on Metzler Ruin artifact bags was 1973.

5. An artifact bag with a 1976 excavation date was assigned to the Comanche Springs collection because to our knowledge, no excavations took place at Metzler Ruin in 1976.

6. Three artifact bags containing items marked with the prefix PBW, indicating Comanche Springs proveniences, were assigned to the Comanche Springs collection. In one of these bags, one artifact marked "MHC 5193" was assigned to the Metzler Ruin collection.

7. Ten remaining artifact bags had no provenience information or excavation dates. They came from a former box not associated with Metzler Ruin so were assigned to the Comanche Springs collection. Because of the uncertainty associated with this decision, I added a comment in the CSAC that their provenience might instead be Metzler Ruin and they should not be used in site-oriented research.

Comanche Springs Artifact Catalogue

Hibben and Ramenofsky recorded very different types of data for excavated artifacts. The CSAC contains one tab for Hibben's excavated artifacts and another tab for Ramenofsky's. Given that Hibben recorded far less information on artifacts, it was fairly simple to produce the Hibben artifact catalogue. Ramenofsky provided much more specific data. For instance, Hibben used very generic provenience descriptions while Ramenofsky provided northing and easting values in addition to structure identifications. The catalogue contains one tab for artifacts collected during Hibben's excavations and another tab for artifacts collected during Ramenofsky's excavations.

Please refer to the previous section, Metzler Ruin Artifact Catalogue, for the discussion of my resolution of proveniences for artifacts that were initially ascribed incorrectly to Metzler Ruin and Comanche Springs.

The following discussion identifies the original data sets used as sources for various data elements in the CSAC. See Appendix A for explanations of the CSAC data elements.

Artifacts from Hibben's Excavations

The initial spreadsheet for 2007.8 (Hibben) artifacts in the CSAC was Dropbox/Data/Maxwell paperwork/excel/Comanche Springs Hibben Artifacts.xls, which can be found under Original Data/Comanche Springs tab: Hibben Artifacts. This Excel spreadsheet contained data for 520 packages of artifacts excavated by Hibben. Table 12 shows which columns of data were used to populate the Hibben tab of the CSAC.

Table 12. Original Data: Comanche Springs Hibben Artifacts.

CSAC Column	Comanche Springs Hibben Artifacts Column
Accn Year	Accn Year
Accn #	Accn No
Obj #	Obj No
Object Name	Object Name
Count	Count
Description Raw Material	Description
Excavation Date	Field Collection Date
Old Box #	Old Box No
New Box #	New Box No
Old ID #	Old Accn No
Comments	Comments
Storage Location	Storage Location
Structure	Provenience (Structure ID)
Provenience	Provenience (additional details)*

*The original records identified Rooms 1, 2, 4, and 5 as Structures 1, 2, 4, and 5 (Ann Ramenofsky, 2018 personal communication).

Additional Hibben artifacts with accession number 2015.3 were provided to me in a spreadsheet created by the volunteers involved in repackaging these artifacts under the direction of Karen Armstrong. The artifacts in the 2015.3 accession number were not available for examination or analysis during Ramenofsky's work. The spreadsheet (in Original Data/Comanche Springs tab: 2015 Accession Hibben) provided data to add artifacts to the Hibben Artifacts tab (Table 13). Four additional artifact bags were "found in an unidentified box in the archives" that contained a note dated 9/23/77 and identifying the artifacts as coming from Comanche Springs.

Table 13. Original Hibben Data: Recent Repackaging Effort.

CSAC Column	2015.3 Accession Column
Accn Year	Accn Year
Accn #	Primary Accn No
Obj #	Obj No
Object Name	Object Name
Count	Count
Description / Raw Material	Description
Excavation Date	Field Collection Date
Old Box #	Old Box #
New Box #	New Box #
Comments	Comments
Storage Location	Storage Location
Structure	Provenience (Structure ID)
Provenience	Provenience (additional details)
Old Bag #	Bag No.
Old ID #	Provenience (xx-yyy)

The provenience data for the 2015.3 artifacts sometimes included information that was more suitably included in other CSAC columns. For example, a provenience of “1960 UNM Field School” was eliminated from the CSAC Provenience column and “1/1/60” was entered under the CSAC “Excavation Date” heading, as no month or day was provided. Some of these proveniences also included some numbers or letters (or both) following the “1960 UNM Field School” designation, and those numbers or letters were left in the CSAC Provenience column. Similarly, entries in an “*m*-*n*” format (where *m* and *n* represent numbers) were eliminated from the Provenience column and entered in the CSAC “Old ID #” column. Hibben often used this two-part number system, in which *m* is the numerical code for a type of artifact and *n* for the *n*th example of that artifact type. Lists of artifacts with such numbering systems appear in the Comanche Springs Document Catalogue (Catalogue Nos. 78.42.40 and 95.29.348) and may provide some additional information on the specific artifacts.[1]

Grid designations were standardized to appear as *yyy*N(or S)/*xxx*E(or W). Similarly, comments at times included information about the type of raw material used or other details about the artifacts, which were moved into the CSAC “Description” column. Comments in the “*m-n*” format were moved to the CSAC “Old ID #” column. The phrase “1960 UNM field school” was eliminated from the comments when found; instead, “1/1/60” was entered in the CSAC “Excavation Date” column if no month or day was provided. Some comments included provenience details; those were moved to the CSAC “Provenience” column. Some artifacts were marked with a date in 1996. However, they also had identification numbers consistent with the numbering scheme Hibben used. In such cases, the 1996 date was moved to the CSAC “Comments” column and marked as being a possible processing date.

Some of the Hibben artifact data included a provenience of “Pueblo B” or “PB,” which is the same as Structure B (Caroline Gabe and David Phillips, 2015 personal communication). The CSAC “Provenience” column includes the original designation, while the entry in the “Structure” column is B.

I found some duplication of object numbers within accession 2015.3. I checked the corresponding boxes and found that in three cases (2015.3.554, 2015.3.1340, and 2015.3.1341), objects corresponding to the duplicate entries could not be found. In those cases I appended the object numbers with “A” and removed the New Box Number from the entry. In the Comments column I noted that these artifacts were missing but indicated the number of the box where they were supposed to be.

Some of the old object numbers were found to be incorrect and were changed (Table 14). Four artifacts (Object Nos. 848 through 851) were originally listed as stored in two current boxes (Nos. 38973 and 38974); all four were found in current Box No. 38973 and the duplicate entries

[1]The two-part number system is simplified from the catalogue system Hibben established for the Maxwell Museum. That system was derived, in turn, from one then in use at the Museum of New Mexico. Under the full system, a letter code indicated the state or region of origin, sometimes with supplemental information to indicate a site. There followed a two-part number, the parts divided by a forward slash. To provide an example, “Bc 50 22/6” can be read: New Mexico (B), Chaco Canyon (c), Site 50, Flaked Stone (22), sixth flaked stone item catalogued.

—*Series Editor*

were eliminated from the CSAC. It should be noted that other volunteers may have entered data for the 2015.3 accession into the Maxwell Museum's Oracle database. As of February 2018, the Oracle database has not been updated with the corrections I have outlined here, so researchers should instead rely on my spreadsheet information. That information will be incorporated in the PastPerfect replacement database being installed by the museum.

Table 14. Corrections to Old Object Numbers.

Current Catalogue No.	Incorrectly Listed as Old ID No.	Corrected to Old ID No.
2015.3.251	22-260	22-258
2015.3.252	22-261	22-260
2015.3.253	22-285	22-261
2015.3.1471	22-289	22-1470
2015.3.1484	22-336	22-1483

Artifacts from Ramenofsky's Excavations

In creating the CSAC entries for artifacts from Ramenofsky's excavations, I followed Dave Phillips' recommendation of combining all data from multiple files into the CSAC to allow researchers to access all available data for a given artifact from a single file. Those who prefer to work with Ramenofsky's original files will find them in the Original Data folder.

The CSAC represents my best effort to collect all of the data resulting from analyses performed on some of the artifacts in the collections. I faced various challenges in creating the catalogue.

Ramenofsky arranged for a variety of analyses and the results were recorded in separate data sets. The sampled items in the analytic results are associated with proveniences and field specimen (FS) numbers but not with a unique artifact. As a result, I was able to link specific analytic results to specific artifacts in only some cases. Future researchers may face the same problem unless a given artifact matches the weight, dimensions, and material listed in the analytic report. Multiple artifacts are packaged together without individual artifact identifications.

New data sets were created for the results of different analyses, without updating earlier data sets. As a result, later, more detailed data may contradict earlier data, especially for weights and counts of artifacts. Following Ramenofsky's advice, I used the later, more detailed data instead of the earlier data whenever such a conflict existed.

Ramenofsky's artifacts were catalogued under accession number 2006.113, using the FS number as the object identifier in the catalogue number. Thus, for example, Catalogue No. 2006.113.12 represents all artifacts assigned FS 12. The FS number corresponds to a specific unit identified by northing and easting values and was used for all artifacts (regardless of type) found in the unit. In general, an FS number was assigned in the field to a group of artifacts packaged in a single bag, so under this approach many artifacts have the same catalogue number. Ramenofsky appended an alphabetic character to the catalogue number to identify different types of artifacts, or in some cases to identify individual artifacts. However, the modified catalogue number often refers to multiple similar artifacts. When I was able to associate analytical results to an individual artifact, I further modified the catalogue number to document the association.

As an illustration, suppose that the sherds and flaked stone from a specific provenience were given FS number 999. The general catalogue number for those items would be 2006.113.999. In the original data I received, the sherds may be identified as 2006.113.999.a and the flaked stone as 2006.113.999.b. If there were three such ceramic artifacts and data identifying the ceramic type for each, I assigned the detailed data to three separate entries for ceramics: 2006.113.999.a1, 2006.113.999.a2, and 2006.113.999.a3. Similarly, if there were two pieces of flaked stone with data on the raw material, I assigned the detailed data to two separate entries for the flaked stones: 2006.113.999.b1 and 2006.999.b2.

Auger tests were conducted outside Structures A and C. Features were identified by number but are not described; many had been disturbed by prior excavations, to the extent that the function could not be identified. See Chapter 3 for details of features identified during Ramenofsky's excavations.

Some artifacts may be listed in the catalogue without any identification of the type of artifact. These may have been destroyed in the process of conducting luminescence tests so are no longer available for inspection. They were included in the catalogue because data relating to the artifacts were available.

For some items listed in the catalogue, a more detailed inspection showed that they were unaltered rocks rather than stone artifacts. In looking through two boxes of artifacts I found little bags containing what looked like rocks and marked "Not lithics." This is one reason why the count of artifacts in an earlier catalogue entry was not necessarily the same as the sum of counts in data sets derived from analyses. See Appendix A for explanations of the CSAC data elements.

In going through some of the boxes of Ramenofsky artifacts in the Maxwell Museum, I found one piece of slag marked with accession number 2011.96. I created an entry in the CSAC from the original data marked on the artifact bag. All other data for Ramenofsky artifacts (all catalogued under accession number 2006.113) came from the Access database and Excel spreadsheets from the Dropbox files. Since I did not have Access myself, I worked from Excel spreadsheets that Phillips extracted from the Access database.

I moved data from the various original data sets onto the Ramenofsky tab of the CSAC in the order discussed below, so I could progress from earlier recorded data to the results of later, more detailed examinations and analyses.

The Ramenofsky files also include a description of the contents of each of the files (Ann Ramenofsky, 2015 personal communication). The CSAC contains a "Discrepancy" column that lists conflicting data recorded in data sets that were thought to be less accurate. For example, analytical data were considered more accurate than the data from initial recording, as listed in Artifact Entry.xlsx and Provenience 6-01.xlsx.

Artifact Entry.xlsx. This Access-derived spreadsheet can be found under Original Data/ Comanche Springs tab: Artifact Entry. The counts and the weights derived from the Access database were subject to change based on later studies or my own examination of artifacts. For each entry, "FS No" identified a specific unit and the "Catalogue Type" (an alphabetic variable) identified a type of object from that given unit. A different alphabetic variable was appended to identify different types of objects (ceramics, flaked stone, sediment, etc.). Columns in the CSAC were populated as shown in Table 15.

Table 15. Original Ramenofsky Data: Artifact Entry.

CSAC Column	Artifact Entry Column
Obj #	FS No
Dup	Catalogue Type
Object Name	ArtifactDesignationID
Count	Count
Weight	Weight
New Box #	Box No

Ceramics.xlsx, Ceramic Terms.xlsx, and Soup Plate.xlsx. These three Access-derived spreadsheets can be found under Original Data/Comanche Springs tabs: Ceramics, Ceramic Terms, and Soup Plate. The three spreadsheets provide additional data for ceramic artifacts. Ceramics.xlsx identifies the vessel type, the ware, and the glaze ware type (Mera letter code) for each ceramic item. Not all items could be identified by glaze ware type. Because the spreadsheet is the result of an in-depth analysis of the ceramic artifacts, the sherd weights in Ceramics.xlsx were used to replace weights originally reported in Artifact Entry.xls if different.

Each artifact was identified by "FS No," and "Cat No" served to identify multiple ceramic artifacts within the same FS number. Since the Artifact Entry.xls data for ceramics in some "FS No" entries indicated multiple artifacts, the "Dup" alphabetic entry in the CSAC was appended with a number to indicate which ceramic artifact was being described. For example, if the count was 3 for FS xxx and Dup a, three entries were made in the CSAC—Object # xxx and Dup a1, a2, and a3—to provide a unique row of data for each of the three ceramic pieces comprising Obj # xxx.a. Columns in the CSAC were populated as shown in Table 16.

Table 16. Original Ramenofsky Data: Ceramics.

CSAC Column	Ceramics Column
Dup, appended by Cat No if Cat No greater than 1	Cat No
Description/Raw Material	Vessel Form
Ceramic Type/Glaze	Type/Glaze Gr
Weight	Weight (if different)
Comments	Comment

The entry for Type in Ceramics.xls is an abbreviation. The full description recorded in the CSAC was obtained from Ceramic Terms.xls.

Comments were also added from Soup Plate.xls. In those comments, TL refers to thermo-luminescence testing.

Provenience 6-01.xlsx. This spreadsheet, derived from the Access database, can be found under Original Data/ Comanche Springs tab: Provenience 6-01. The data are listed by FS No and by type of artifact found. Some artifacts were tested by thermoluminescence, which destroys the sample. If a sample consisted of multiple pieces, some pieces of the sample may survive in the Maxwell Museum collections (others may have been destroyed). Data for these artifacts are included in the CSAC and "thermoluminescence" is indicated in the Comments column.

Some artifacts are included in Provenience 6-01.xlsx even though they did not make their way into the collection. These artifacts are identified in the spreadsheet without an entry for New Box #; all available data are provided in the spreadsheet.

Horizontal provenience data included the Easting and Northing values for Units. Units occurred both inside and outside structures. Room numbers were not provided, and rooms can only be identified by comparing the Easting and Northing values to maps. The Extramural column includes a Yes or No to indicate whether an artifact was from outside (Yes) or inside (No) the structure. For artifacts found outside a structure, "- extra" was added to the contents of the "Structure" column in the CSAC.

When the auger test comprised the entire unit, the unit level was the auger level. Otherwise, the unit level was entered into the CSAC. Features were identified within units. The level within the feature is provided separately from the unit level where the feature was identified. Columns in the CSAC were populated as shown in Table 17.

Table 17. Original Ramenofsky Data: Provenience 6-01.

CSAC Column	Provenience 6-01 Column
Unit Easting	Easting
Unit Northing	Northing
Structure; appended with "- extra" to indicate an extramural context.	Structure
Excavation Date	Excavation
Unit/Auger level	Unit level
Feature	Feature No
Feature level	Feature Level
Auger #	Auger test

Auger Tests.xlsx. This spreadsheet, derived from the Access database, can be found under Original Data/ Comanche Springs tab: Auger Tests. Only auger tests that yielded artifacts are listed in the CSAC. It appears that in some cases, the same auger test number was used for more than one test. All auger tests were conducted in extramural areas around Structure A and Structure C (A. Ramenofsky, 2015 personal communication). Table 18 lists all auger tests conducted during Ramenofsky's excavations and indicates the number of levels excavated and whether artifacts were found.

Table 18. Auger Tests at Comanche Springs.

Test No.	Easting	Northing	Structure	No. of Levels	Artifacts
1	5022	3009	A south	2	No
2	5021	3005	A south	3	No
3	5018	3010	A south	3	No
4	5016	3007	A south	3	Yes
5	5014	3012	A south	3	Yes
6	5010	3013	A south	2	Yes
7	5009	3010	A south	2	Yes
8	4937	2551	C east	3	Yes
9	5003	3011	A south	2	Yes
9	4935	2551	C east	3	Yes
10	5012	3005	A south	2	Yes
10	4933	2551	C east	2	Yes
11	5008	3006	A south	2	Yes
11	4931	2551	C east	3	Yes
12	5010	3001	A south	3	Yes
13	5006	3001	A south	2	Yes
13	4939	2549	C east	3	Yes
14	5003	3002	A south	1	No
14	4937	2549	C east	3	No
15	5004	2996	A south	3	No
15	4935	2549	C east	3	Yes
16	4998	3003	A south	2	Yes
16	4933	2549	C east	2	Yes
17	4998	2998	A south	3	No
17	4931	2549	C east	2	Yes
18	4930	2549	C east	2	Yes
19	4939	2547	C east	3	Yes
20	4937	2547	C east	2	No
21	4935	2547	C east	3	Yes
22	4933	2547	C east	3	Yes
23	4931	2547	C east	2	Yes
25	4939	2545	C east	3	Yes
26	4937	2545	C east	2	Yes

Table 18. Auger Tests at Comanche Springs.

Test No.	Easting	Northing	Structure	No. of Levels	Artifacts
27	4935	2545	C east	2	Yes
28	4933	2545	C east	2	No
29	4931	2545	C east	2	No
31	4939	2543	C east	3	Yes
32	4937	2543	C east	3	No
33	4935	2543	C east	3	No
34	4933	2543	C east	3	Yes
35	4931	2543	C east	3	Yes
37	4939	2541	C east	3	Yes
38	4937	2541	C east	3	Yes
39	4935	2541	C east	3	Yes
40	4933	2541	C east	3	Yes
41	4931	2541	C east	3	Yes
46	4933	2539	C east	2	Yes
47	4931	2539	C east	2	Yes
49	4931	2550	C east	3	Yes
51	4931	2548	C east	3	Yes
52	0	0	C west	5	Yes
53	0	0	C west	5	No
54	0	0	C west	0	No

Debitage Analysis 2008.xlsx. This spreadsheet, derived from the Access database, can be found under Original Data/ Comanche Springs tab: Debitage Analysis 2008. The data derive from Ramenofsky's analysis of all of the flaked stone with selected FS numbers (A. Ramenofsky, 2015 personal communication). The data set contains the results of that analysis for individual pieces of flaked stone. In most cases the original bag was catalogued using the FS number plus an alphabetic variable and often contained multiple artifacts. The data set does not identify which data line corresponds to a given artifact in each bag. Ramenofsky indicated that the resulting analytical data are more accurate than those recorded in Artifact Entry.xlsx and should be used instead (A. Ramenofsky, 2015 personal communication).

In the Dup column of the CSAC I appended a number (starting with 1) to the alphabetical variable to create a unique identifier for each artifact. However, a researcher who goes through a bag of flaked stone may not be able to tell which piece is which without identifying raw materials and weighing each piece. It is also possible that some collected pieces were not flaked stone; in that case, they may not be accounted for in the CSAC even if they may appear in an artifact bag with the appropriate catalogue number.

For artifacts originally classified as FS No. 281 or greater, the data set contains an Artifact ID entry, which was used to identify a unique artifact.

One artifact each from FS Nos. 5018 and 5028 were not originally recorded in Artifact Entry.xlsx. The Easting, Northing, Unit Level, and Excavation Date in the CSAC were found via the Provenience ID entry in Provenience 6-01.xlsx.

In some cases, analytical results were available but it was not possible to identify the corresponding piece of flaked stone, because FS No in the analytical report corresponds to multiple pieces of flaked stone. Many of these cases involve pieces of obsidian. Some obsidian pieces were removed for a hydration study and were stored in a different box; in those cases, the New Box # entry indicates the correct box number.

I identified some individual artifacts based on a matching recorded weight. When I could not identify pieces uniquely, I lumped the alphabetic values in the CSAC Dup column (e.g., if an entry could refer to either 2006.113.xyz.b or 2006.113.xyz.d, the value in the Dup column is shown as "b,d"). If this lumping included items stored in different boxes, the CSAC "Discrepancy" column lists the boxes that would need to be searched to identify the artifact. In other words, at times it may be necessary to pull out all of the flaked stone from a given FS No value in order to identify the individual artifact that corresponds to a specific CSAC entry.

Nine artifacts in this data set had neither an FS No value nor a Provenience ID entry. These artifacts included three pieces of chalcedony, five of obsidian, and one of coarse quartzite. Their location is unknown. They are not included in the CSAC.

Weights were updated. Comments were added to any already recorded comments. Counts were adjusted to reflect the data from this data set. Entries already in the CSAC "Description" column were appended with an identification of the artifact's raw material, and Description was renamed Description/Raw Material. Columns in the CSAC were populated as listed in Table 19.

Table 19. Original Ramenofsky Data: Debitage Analysis, 2008.

CSAC Column	Debitage Analysis 2008 Column
Dup	
Weight	Weight
Description/Raw Material	Description and Raw Material
Condition	Condition
Technology	Technology
Platform Abrasion	Platform Abrasion
Platform Surface	Platform Surface
Use Wear	Use Wear
Thermal	Thermal
Comments	Comments
Artifact ID	ArtifactID
Discrepancy	

The "Lookup" Spreadsheets. Lookup Condition Debitage.xlsx, Lookup Platform Abrasion.xlsx, Lookup Platform Surface.xlsx, Lookup Raw Material.xlsx, Lookup Technology.xlsx, Lookup Use Wear.xlsx, and Lookup Thermal.xlsx, all derived from the Access database, can be found in Original Data/Comanche Springs, on sheets with tabs with the names just provided.

Lookup tables interpret each of the abbreviations appearing in the Raw Material, Condition, Technology, Platform Abrasion, Platform Surface, and Use Wear Thermal columns in the Debitage Analysis 2008.xlsx spreadsheet. The descriptions in the lookup tables were substituted for the abbreviations in the CSAC.

I do not understand exactly what many of these descriptions indicate. It seemed odd that many artifacts with a Condition of "flake fragment" list a Technology of "core." For artifacts with both Platform Abrasion and Platform Surface of "no platform," and Condition of "flake fragment, no platform," I abbreviated Condition to "flake fragment."

LA 14904 Obsidian Catalog.xlsx. Also derived from the Access database, this spreadsheet can be found under Original Data/Comanche Springs tab: Obsidian Catalog. The data set describes obsidian pieces listed by FS No value. Comments were added to either the Comments or Description/Raw Material columns in the CSAC as appropriate. Some comments were not transferred if multiple flaked stone items were involved, as there was no way to determine which piece of flaked stone the comment referred to.

Some of the artifacts listed in this data set as obsidian were not pulled for further analysis. Debitage Analysis 2008.xlsx listed them as being made from some other raw material. I did not list this as a Discrepancy because I assumed that Debitage Analysis 2008.xlsx was more accurate.

This data set indicates that some artifacts were from "Below C." Each such FS No value (185, 278, 279, 280, 327, and 328) already had a CSAC entry under Structure of "c east – extra," which was obtained from Provenience 6-01.xls*x*. I changed the CSAC entry under Structure to "under c east - extra."

Obsidian Pulls for Sourcing.xlsx and Obsidian Source Values.xlsx. These spreadsheets were derived from the Access database and can be found in Original Data/Comanche Springs, on pages tabbed with the same names as above.

Obsidian Pulls for Sourcing provides the results of source analysis of obsidian. The name of the source is abbreviated; the abbreviation is explained in Obsidian Source Values, and the full names provided there were used to populate the Obsidian Source column in the CSAC. Comments were added as appropriate. The Description/Raw Material column of the CSAC was updated for any artifact which had not previously been identified as obsidian and whose source was identified by this analysis.

Some FS No values corresponded to more than one obsidian artifact. I used the accession number (duplicate) or the weight data from the handwritten sheets accompanying Richard Hughes's Geochemical Research Laboratory Letter Report 2002-20 (included here in Appendix

B and available as Catalogue No. 2006.113.6008a), or both, to determine which obsidian artifact had been analyzed by source where possible. If there was a discrepancy between the weight reported by Hughes analysis and the one in Debitage Analysis 2008.xlsx, I used Hughes' weight. In some cases weight was the only way to identify artifacts uniquely. In other cases there was no way for me to determine which artifact had been analyzed as to its source (Table 20). A specialist familiar with obsidian sources could resolve the ambiguities.

Table 20. Indistinguishable Artifacts: Obsidian Sources.

FS No value for Indistinguishable Items	Identifiable Obsidian Sources
187h, i, k	187h is Government Mtn.; 187i is Obsidian Ridge; 187k is Grants Ridge.
187d, g	187g is Horace Mesa.
196c, d, h, j	196d and 196h are Cerro del Medio.
196e, f, g, i	196e and 196i are Horace Mesa; 196f and 196g are Obsidian Ridge.
205c, e	205e is Obsidian Ridge
214c, g, h, i	214g and 214h are Cerro del Medio.
273c, d	237d is Grants Ridge.
276c, d, g	276c is Obsidian Ridge.
280a, l, m, o	280m and 280o are Grants Ridge.
280d, n, p	280d is Grants Ridge; 280n is Obsidian Ridge; 280p is Cerro del Medio.

FS No 273c, listed in Table 20, was listed in the handwritten sheets (Cat. No. 2008.113.6008a) as "cat 53" but there is no "cat 53" in Obsidian Pulls for Sourcing.xlsx. FS No 275f was listed in the handwritten sheets as "cat 55" and "cat 55" was listed as FS No 273 in Obsidian Pulls for Sourcing.xlsx. I assumed that this was a typo (273 with "cat 55" should have been 275 with "cat 55" in Obsidian Pulls for Sourcing.xlsx) and that 275f was sourced from Obsidian Ridge since the weights in the two files matched.

LA 14904 Structure A.xlsx and LA 14904 Structure C.xlsx. These spreadsheets, derived from the Access database, can be found in Original Data/Comanche Springs, on sheets tabbed with the same names as above. Both data sets list the FS No of each unit associated with a Structure; the information includes the Northing and Easting, Feature, Level, and a summary of the number of artifacts found by category (charcoal, slag, ceramics, flakes, obsidian and "other artifacts"). There are slight differences in the Northing and Easting listed compared to those from Provenience 6-01.xlsx which were used to populate the CSAC. These differences are identified in the Discrepancy column of the CSAC. The numbers of items are not necessarily exact, and in some cases ranges are indicated (and Excel may have converted the number range into a date format. For example, "5-Feb" actually means a range of 2 to 5 artifacts [A. Ramenofsky, 2015 personal communication]). The flaked stone or obsidian categories were entered before the lithic analysis was conducted by Phil Geib. Some information from the “other artifact” data column was added to the CSAC (into Comments or Description/Raw Material or both, as appropriate).

There are a number of mentions of prill being found as an “other artifact,” and for FS 208 “other artifact” reads “3 prills = slag.” There is no mention of “prill” in any of the other data sets processed so far. In mining parlance, prill refers to small globules, often spherical, that form when a liquid material such as slag congeals in mid-air.

These data sets list some artifacts that were sent for thermoluminescence testing and were destroyed, so are not in the Maxwell Museum collections. Some of the artifacts are listed in the catalogue but with only minimal data. Most of these artifacts are not listed in the data sets discussed previously.

Features from Ramenofsky's Excavations

Ann Ramenofsky provided the data set Provenience 6-01_features.xls to me directly, after deriving it from several of the Access database tables. The spreadsheet can be found in Original Data/Comanche Springs tab: Features. The data set describes features found in and around Structures A and C. All features were excavated in 1998.

Documents

Original Data also contains a few reference documents in Word (Table 21).

Table 21. Original Data: Word Documents.

Author(s)	Date	Title
Ramenofsky	9/1/98	Excavation Summary: LA 14904 Comanche Springs
Ramenofsky?		Summary: Comanche Springs Test: 11/8–11/10/1996
Ramenofsky	10/26/07	Comanche Springs Overview (LA 14904) (draft)
Ramenofsky*	2010	Exploring the Nature of Hybrid Communities in 17th Century NM
Vaughan		Metallurgy Section_DV_draft 1
Melzer		*Los Ojuelos* or Comanche Springs
Ramenofsky and Vaughan		Comanche Springs: A Hybrid Community, Rio Abajo (draft)
Vaitkus	1999	Sieving Processes for LA 14904 Float Samples

*Included in this report as Appendix F.

COMANCHE SPRINGS BIBLIOGRAPHY

Many documents in the Maxwell Museum archives are not yet catalogued. Catalogue numbers are provided where available. Under FERPA, the Museum may not release certain student names. Those students are listed as “Anonymous Student” along with initials, unless a waiver has been obtained or the student is known to be deceased.

Adler, Mildred S.

1973 Armor. Unpublished report. Maxwell Museum of Anthropology archives, Catalogue No. 95.29.397. University of New Mexico, Albuquerque.

n.d. Mining History of the Comanche Springs Archaeological Site Area, New Mexico. Photocopy of unpublished report. Maxwell Museum of Anthropology archives, Catalogue No. 2009.30.9. University of New Mexico, Albuquerque.

Agogino, George A.

1977 The Mysterious Chalchihuitl, Green Stone of Ancient Mexico. *Anthropological Journal of Canada* 15(3): 22–25. Maxwell Museum of Anthropology archives, Catalogue No. 95.29.404. University of New Mexico, Albuquerque.

Akins, Nancy

1973 A Preliminary Report on the Ceramics of Pueblo B, Comanche Springs, NM. Unpublished report. Maxwell Museum of Anthropology archives, Catalogue No. 95.29.395. University of New Mexico, Albuquerque.

Anonymous Student AVM

n.d. An Examination of Southwest Colonoware Forms and Mexican Majolica Forms: With a re-firing analysis of soup plates and ollas from Comanche Springs, NM. Report to Patricia Crown. Maxwell Museum of Anthropology archives, Catalogue No. 2006.113.6025a. University of New Mexico, Albuquerque.

Anonymous Student RR

n.d. Pollen Study of Comanche Springs Site, Tome, NM. Unpublished report. Maxwell Museum of Anthropology archives, Catalogue No. 95.29.400. University of New Mexico, Albuquerque.

Benedict, C. B.

1993 Inventory of the Metzler Ruin, Site AR 03-03-04-499. Report prepared for the Mountainair Ranger District, Cibola National Forest, Mountainair, N.M.

Boyd, Jennifer

2000 Sieving of Float Samples. Unpublished report. Maxwell Museum of Anthropology archives, Catalogue No. 2006.113.6007a. University of New Mexico, Albuquerque.

Chavez, Fray Angelico
1954 *Origins of New Mexico Families*, University of Albuquerque and Calvin Horn Publishers, Inc., Albuquerque.

Chavez, T.
1972 Geographics of the Comanche Springs Archeological Site, New Mexico. Unpublished report. Maxwell Museum of Anthropology archives, Catalogue No. 2009.30.6. University of New Mexico, Albuquerque.

Chavez, Theo Jr.
1972 Comanche Springs Canyon. Unpublished report. Maxwell Museum of Anthropology archives, Catalogue No. 78.42.40. University of New Mexico, Albuquerque.

Chavez, William X.
1997 Petrography of Slag. Email report to Ann Ramenofsky by New Mexico Institute of Mining and Technology, Socorro. Maxwell Museum of Anthropology archives, Catalogue No. 2006.113.6005a. University of New Mexico, Albuquerque.

Cox, J. Royce
1998 Archaeomagnetic Dating. Letter report to Ann Ramenofsky by Archaeomagnetic Dating Laboratory, N.M. Office of Archaeological Studies, Santa Fe. Maxwell Museum of Anthropology archives, Catalogue No. 2006.113.6001a. University of New Mexico, Albuquerque.

Dean, Jeffrey S.
1999 Dendrochronology. Letter report to Ann Ramenofsky by University of Arizona Laboratory of Tree-Ring Research, Tucson. Maxwell Museum of Anthropology archives, Catalogue No. 2006.113.6004a. University of New Mexico, Albuquerque.

Ellis, Florence Hawley
1955 Tome and Father J. B. R. *New Mexico Historical Review* 30(2):89-114

Feathers, James
2000 Thermoluminescence Dating of Pottery. Email and unpublished report to Ann Ramenofsky by Luminescence Laboratory, University of Washington. Maxwell Museum of Anthropology archives, Catalogue No. 2006.113.6003a. University of New Mexico, Albuquerque.

Fulgham, Tommy, and Frank C. Hibben
n.d. Archaic Bison Hunting Culture of the Comanche Springs Archaeological Site, New Mexico. Manuscript. Maxwell Museum of Anthropology archives, Catalogue No. 2009.30.12. University of New Mexico, Albuquerque.

Gallegos, Elena, Heather MacCurdy, Howard Snell, and Tom Giermakowski
n.d. *Herpetofauna of Comanche Springs and the Surrounding Area.* Copy of printed article from unknown publication. Maxwell Museum of Anthropology archives, Catalogue No. 2009.1.36. University of New Mexico, Albuquerque.

Harkins, Dakota J.
2005 *Watershed Management.* Submitted in Copy of printed article from unknown publication. Maxwell Museum of Anthropology archives, Catalogue No. 2009.1.36. University of New Mexico, Albuquerque.

Hibben, Frank C.
1976 Excavation at Comanche Springs. Photocopy of unpublished report. Maxwell Museum of Anthropology archives, Catalogue No. 2009.30.2. University of New Mexico, Albuquerque.

1992 An Archaic Bison-Hunting Culture. *The Artifact* 30(4):17–27.

Hibben, Frank C., Ben Benjamin, and Mildred S. Adler
1985 Comanche Springs—The Spanish Period at Comanche Springs, New Mexico—A Silver Assaying Station of the Early Seventeenth Century. *The Artifact* 23(3):41–78.

Hood, Darden
1999 C-14 Dating. Letter report to Ann Ramenofsky by Beta Analytic. Maxwell Museum of Anthropology archives, Catalogue No. 2006.113.6002a. University of New Mexico, Albuquerque.

Horizon Corporation.
1975 HCIA to Develop Park and Archaeological Sites, Update ’75. Horizon Corporation’s Rio Communities, Belen. Maxwell Museum of Anthropology archives, Catalogue No. 2009.30.3. University of New Mexico, Albuquerque.

Hughes, Richard E.
2002 Obsidian Hydration. Letter report to Ann Ramenofsky by the Geochemical Research Laboratory, Portola Valley, California. Maxwell Museum of Anthropology archives, Catalogue No. 2006.113.6008a. University of New Mexico, Albuquerque.

Julyan, Robert
1998 *The Place Names of New Mexico* (revised edition). University of New Mexico Press, Albuquerque.

Lister, Florence C., and Robert H. Lister
2000 Maiolica in Colonial Spanish America. *Historical Archaeology* 8:17–51. Maxwell Museum of Anthropology archives, Catalogue No. 95.29.403. University of New Mexico, Albuquerque.

Mather, Kirtley F.
1973 Notes on the Geology of the Comanche Springs Archaeological Site NM. Unpublished report. Maxwell Museum of Anthropology archives, Catalogue No. 95.29.402. University of New Mexico, Albuquerque.

McLemore, Virginia T.
2017 *Mining Districts and Prospect Areas in New Mexico*. Resource map 24. New Mexico Bureau of Geology and Mining Resources New Mexico Institute of Mining and Technology. Socorro, NMN

McLemore, Virginia T. and Virgil Lueth
2017 *Metallic Mineral Deposits*. New Mexico *Bureau of Geology & Mineral Resources and the New Mexico Geological Survey, Memoir 50. Socorro*

Melzer, Richard
n.d. Los Ojuelos or Comanche Springs. Manuscript. Maxwell Museum of Anthropology archives, Original Data/Documents project computer file. University of New Mexico, Albuquerque.

Milford, Homer E.
1996 Letter to Ann Ramenofsky dated Nov. 12, 1996. Maxwell Museum of Anthropology archives, Catalogue No. 2006.113.9. University of New Mexico, Albuquerque.

Olsen, John W., and Stanley J. Olsen
1976 Faunal Remains from the Spanish Occupation at Comanche Springs. Unpublished report. Maxwell Museum of Anthropology archives, Catalogue No. 95.29.399. University of New Mexico, Albuquerque.

Pinson, Ariane
1998 Geoarchaeology of the Structure C Area Site LA 14904 Comanche Springs. Unpublished report. Maxwell Museum of Anthropology archives, Catalogue No. 2006.113.6012a.

Ramenofsky, Ann F.
1997 Summary: Comanche Springs Test: 11/8-11/10/1996. Unpublished report. Maxwell Museum of Anthropology Archives, Original Data/Documents computer file. University of New Mexico, Albuquerque. [Authorship and year uncertain.]

1998 Excavation Summary: LA 14904 Comanche Springs. Unpublished report. Maxwell Museum of Anthropology archives, Catalogue No. 2005.7.37 and in Original Data/Documents computer file. University of New Mexico, Albuquerque.

1999 Current Research in NM. *Society for Historical Archaeology Newsletter* 32(4):31.

2007 Comanche Springs Overview (LA 14904). Manuscript. Maxwell Museum of Anthropology archives, Original Data/Documents computer file. University of New Mexico, Albuquerque.

Ramenofsky, Ann F.
2010 Exploring the Nature of Hybrid Communities in 17th Century New Mexico: Comanche Springs. Presentation to the symposium titled "The Borderlands West: 300 Years of Intercultural Connections," Society for Historical Archaeology 2010 Conference, Amelia Island, Florida.

Ramenofsky, Ann F., Shawn Penman, Richard Flint, and William X. Chavez
n.d. Comanche Springs Report (LA 14904). Marked "Final." Maxwell Museum of Anthropology Archives, Catalogue No. 2005.7.67. University of New Mexico, Albuquerque.

Ramenofsky, Ann F., and C. David Vaughan
n.d. Comanche Springs: A Hybrid Community in Rio Abajo. Draft manuscript. Maxwell Museum of Anthropology archives, Original Data/Documents computer file. University of New Mexico, Albuquerque.

Ramenofsky, Ann F., C. David Vaughan, and Michael N. Spilde
2008 Seventeenth-Century Metal Production at San Marcos Pueblo, North-Central New Mexico, in *Archaeology Volume 42, Number 4:105-131, Journal of The Society for Historical Archaeology*. J.W. Joseph, Editor, New South Associates, Inc., Stone Mountain.

Rhodes, Diane Lee
1997 Coronado Fought Here: Crossbow Boltheads as Possible Indicators of the 1540-1542 Expedition, in *Flint & Flint: The Coronado Expedition to Tierra Nueva*

Scurlock, Dan, Peggy Gerow, David Kramer, and Ron Stauber
1995 *The Cultural Resources of Tomé Hill: A Multidisciplinary Investigation.* Office of Contract Archeology Report No. 185-539B, University of New Mexico, Albuquerque.

Seifert, Donna J.
1980 *The Historic Occupations of Comanche Springs: An Assessment of Historical and Archaeological Potential*. Center for Anthropological Studies, Albuquerque. Maxwell Museum of Anthropology archives, Catalogue No. 2009.30.1. University of New Mexico, Albuquerque.

Shure, Steve, Jack Lobdel, and T. R. Lyons
1970 Notes on the Comanche Springs Site, Valencia County, New Mexico. Typed and hand-edited site visit report. Maxwell Museum of Anthropology archives, Catalogue No. 78.42.16. University of New Mexico, Albuquerque.

Simmons, Marc
1973 Hacienda de Ojuelos, *The Little Lion of the Southwest: A Life of Manuel Antonio Chaves*, Swallow Press, Chicago.

Sinkovec, C. B.
2012 *Metzler Ruin Section 110 Survey*. Report prepared for the Mountainair Ranger District, Cibola National Forest, Mountainair, N.M.

Vaitkus, Katerina
1999 Sieving Processes for LA 14904 Float Samples. Original Data/Documents computer file. University of New Mexico, Albuquerque.

Vaughan, C. David
2006 *Taking the Measure of New Mexico's Miners, Mining, and Metallurgy*. Ph.D. dissertation, University of New Mexico, Albuquerque. ProQuest, Ann Arbor.

2017 Metallurgy and its Consequences in the New Mexico Colony. In *The Archaeology and History of Pueblo San Marcos*, edited by Ann F. Ramenofsky and Kari L. Schleher, pp.185-204. University of New Mexico Press, Albuquerque.

n.d. Metallurgy Section_DV_draft 1.doc. Draft manuscript. Maxwell Museum of Anthropology archives, Original Data/Documents computer file. University of New Mexico, Albuquerque.

Appendix A

DATA ELEMENTS

Several catalogues (Excel spreadsheets available from the Maxwell Museum) were created to hold data about the artifacts and documents for both Comanche Springs and Metzler Ruin. The Comanche Springs Artifact Catalogue (CSAC) and the Metzler Ruin Artifact Catalogue include all the currently available data that can be related to individual artifacts in the Maxwell Museum collections. Similarly, the Comanche Springs Document Catalogue and the Metzler Ruin Document Catalogue include all the known documents in the Maxwell Museum collections. Future researchers should be aware that at this time, the collections include duplicate documents and that in some cases, multiple catalogue numbers have been assigned to a given document.

The contents of the artifact catalogues and explanations of the data they contain are listed in Tables A.1–A.3. Where possible, explanations and data classifications are the same. The CSAC is especially complex because artifacts listed there are from two excavations, the first tab includes those from Hibben's excavations and the second tab includes those from Ramenofsky's excavations. Their field techniques, data collection approaches, and analyses all varied.

Comanche Springs

Table A.1 identifies the data elements common to both tabs in the CSAC spreadsheet (i.e., for artifacts from both the Hibben and Ramenofsky excavations).

Table A.2 identifies additional unique data elements for artifacts from Hibben's excavations. The data for Hibben artifacts with accession number 2007.8 were recorded for this catalogue during Ramenofsky's analysis of Comanche Springs artifacts. Data for artifacts with accession numbers 51.2 and 2005.68 were recorded during my study in 2015. I believe that these artifacts were excavated by Hibben. Data for artifacts with accession number 2015.3 were recorded initially during my study in 2015 and later in 2017 when I located additional artifacts that had not been completely repackaged.

Table A.3 identifies the additional unique data elements for artifacts from Ramenofsky's excavations. One piece of slag has accession number 2011.96 but I believe that it was excavated by Ramenofsky, based on the provenience. The latter includes Northing and Easting values, which Hibben did not use.

Table A.4 provides a list of the object names used in the CSAC.

Table A.1. CSAC Shared Data Elements (All Excavations).

Column Heading	Definition
Accn Year	Year the accession was recorded by the Maxwell Museum.
Accn #	Nth accession in the accession year at the Maxwell Museum.
Obj #	Nth artifact within the accession.
Dup	Alphabetic character used to distinguish multiple objects with the same accession number. In some cases the alphabetic character will be followed by a number, because Ramenofsky grouped artifacts within a duplicated object number.
Object Name	Category of artifact (ground stone, flaked stone, ceramic, etc.)
Count	Number of objects. In some cases the count was first recorded as “a bagful” and the count was provided by the creators of the input data.
Description/Raw Material	Type of artifact (olla, jar, plate, projectile point, etc.) or material (obsidian, chalcedony, etc.)
Excavation Date	Date artifact was removed from the field. “1/1/xx” indicates that only the year (xx) is known.
New Box #	Number of the plastic storage box in the Maxwell Museum collections that contains the artifact bag.
Storage Location	ID for Maxwell Museum shelf where plastic storage box is located.
Comments	

Table A.2. CSAC Additional Unique Data Elements: Hibben Excavations.

Column Heading	Definition
Structure	Three buildings identified as A, B, C. In some cases the provenience “Pueblo B” was used in addition to “Structure B.” If the provenience was Pueblo B but not also Structure B, the Structure column entry will read “B?”
Provenience	Where the artifact was found.
Old Box #	Original storage box before rehousing project.
Old Bag #	When artifacts were rehoused in 2015, some old bags were numbered.
Old ID #	Previously recorded identification number; 11.x = ceramic, 8.x = metal.

Table A.3. CSAC Additional Unique Data Elements: Ramenofsky Excavations.

Column Heading	Definition
Weight	In grams.
Obsidian Source	Source site of obsidian as identified by Hughes’ testing.
Ceramic Type/ Glaze	Type of ceramic, and Mera glaze type if provided.
Structure	Three buildings identified as A, B, C. In some cases a cardinal direction is included along with “extra” to identify a provenience outside the building.
Unit Easting	From Ramenofsky work.
Unit Northing	From Ramenofsky work.
Auger #	Number of the auger test.
Unit/Auger level	Level within the unit or auger test.
Feature	By number.

Table A.3. CSAC Additional Unique Data Elements: Ramenofsky Excavations.

Column Heading	Definition
Feature level	Level within the feature.
Discrepancy	Identification of conflicting data among Ramenofsky project's data sets. Entries take the form "data set name: data differing from what is listed."
Condition	Of artifact.
Technology	For lithic artifacts, information in addition to "Description/Raw Material."
Platform Abrasion	Evidence of lithic platform and abrasion, if any.
Platform Surface	Evidence of lithic platform or scars or both.
Use Wear	Evidence of lithic use pattern.
Thermal	Evidence of heating or burning of lithic artifacts.
ArtifactID	Retained from Ramenofsky data sets and at times used to identify a unique artifact when other identifications were not specific.

Table A.4. CSAC Object Names.

Adobe	Flaked Lithics	Misc	Seed
Bone	Float	Misc Lithics	Shell
Ceramic	Fossil	Misc Stone	Slag
Charcoal	Groundstone	Old bag labels	Soil
Concretions	Metal	Ore	Unknown
Corn	Mineral	Sediment	Wood

Metzler Ruin

Artifacts at Metzler Ruin were collected under the direction of Frank Hibben. The Metzler Ruin artifact catalogue follows much the same format as that for the CSAC. In addition to the data described in Tables A.1 and A.2, there is one additional, unique data element, "Provenience," that identifies the location where the artifact was found. The Object Names are consistent with those listed in Table A.4.

Appendix B

HUGHES OBSIDIAN ANALYSIS

2006.113.6008a

Geochemical Research Laboratory Letter Report 2002-20

July 31, 2002

Dr. Ann F. Ramenofsky
Department of Anthropology
University of New Mexico
Albuquerque, New Mexico 87131-1086

All Data are Entered

Dear Ann:

Enclosed with this letter you will find a seven-page table presenting energy dispersive x-ray fluorescence (xrf) data generated from the analysis of 109 artifacts from the Comanche Springs site (LA 14904), New Mexico. Although you submitted 110 specimens, one of them (cat. no. 72) was too small (i.e. < ca. 9-10 mm diameter) and thin (i.e. < ca. 1.5 mm thick) for generating reliable quantitative data by xrf. This research was conducted pursuant to your letter request of January 18, 2002.

Analyses of obsidian are performed at my laboratory on a Spectrace™ 5000 (Tracor X-ray) energy dispersive x-ray fluorescence spectrometer equipped with a rhodium (Rh) x-ray tube, a 50 kV x-ray generator, with microprocessor controlled pulse processor (amplifier) and bias/protection module, a 100 mHz analog to digital converter (ADC) with automated energy calibration, and a Si(Li) solid state detector with 160 eV resolution (FWHM) at 5.9 keV in a 30 mm² area. The x-ray tube is operated at 34.0 kV, .26 mA, using a .127 mm Rh primary beam filter in an air path to generate x-ray intensity data for elements zinc (Zn Kα), gallium (Ga Kα), rubidium (Rb Kα), strontium (Sr Kα), yttrium (Y Kα), zirconium (Zr Kα), and niobium (Nb Kα). Barium (Ba Kα) intensities are generated by operating the x-ray tube at 50.0 kV, .35 mA, with a .63 mm copper (Cu) filter, while those for titanium (Ti Kα), manganese (Mn Kα) and total iron ($Fe_2O_3^T$) are generated by operating the x-ray tube at 15.0 kV, .30 mA with a .127 mm aluminum (Al) filter. Iron vs. manganese (Fe Kα/Mn Kα) ratios are computed from data generated by operating the x-ray tube at 15.0 kV, .30 mA, with a .127 mm aluminum (Al) filter. Deadtime-corrected analysis time for each sample appears in the data table.

X-ray spectra are acquired and elemental intensities extracted for each peak region of interest, then matrix correction algorithms are applied to specific regions of the x-ray energy spectrum to compensate for inter-element absorption and enhancement effects. After these corrections are made, intensities are converted to concentration estimates by employing a least-squares calibration line established for each element from analysis of up to 30 international rock standards certified by the U.S. Geological Survey, the U.S. National Institute of Standards and Technology, the Geological Survey of Japan, the Centre de Recherches Petrographiques et Geochimiques (France), and the South African Bureau of Standards. Further details pertaining to x-ray tube operating conditions and calibration appear in Hughes (1988a, 1994b). Extremely small/thin specimens are analyzed using a .25 mm² primary beam collimator, and resulting data normalized using a sample mass correction algorithm. Deadtime-corrected analysis time is greatly extended in all instances when primary beam collimation is employed. Trace element measurements in the xrf data table are expressed in quantitative units (i.e. parts per million [ppm] by weight), and matches between unknowns and known obsidian chemical groups are made on the basis of correspondences (at the 2-sigma level) in diagnostic trace element concentration values (in this case, ppm values for Rb, Sr, Y, Zr, Nb, Ba, Ti, Mn and $Fe_2O_3^T$) that appear in Anderson et al. (1986), Baugh and Nelson (1987, 1988), Glascock et al. (1999), Hughes (1984, 1988b), Hughes and Nelson (1987), Jack (1971), Nelson (1984), Shackley (1995, 1998), and unpublished data on other obsidians (e.g. Hughes 1994a; 1995a, b; 1997; page 4 of data table herein). Artifact-to-obsidian source (geochemical type, *sensu* Hughes 1998) correspondences were considered reliable if diagnostic mean measurements for artifacts fell within 2 standard deviations of mean values for source standards. I use the term "diagnostic" to specify those trace elements that are well-measured by x-ray fluorescence, and

2006.113.606 8a

whose concentrations show low intra-source variability and marked variability across sources. In short, diagnostic elements are those concentration values allowing one to draw the clearest geochemical distinctions between sources (Hughes 1990, 1993). Although Zn and Ga ppm concentrations also were measured and reported for each specimen, they are not considered "diagnostic" because they don't usually vary significantly across obsidian sources (see Hughes 1982, 1984). Ga occurs in concentrations between 10-30 ppm in nearly all parent obsidians in the study area and Zn ppm values are infrequently diagnostic; they are always high in Zr-rich, Sr-poor peralkaline volcanic glasses.

The trace element composition measurements in the enclosed table are reported to the nearest ppm to reflect the resolution capabilities of non-destructive energy dispersive x-ray fluorescence spectrometry. The resolution limits of the present x-ray fluorescence instrument for the determination of Zn is about 3 ppm; Ga about 2 ppm; for Rb about 4 ppm; for Sr about 3 ppm; Y about 2 ppm; Zr about 4 ppm; Nb about 2 ppm; and Ba about 10 ppm (see Hughes [1994b] for other elements). When counting and fitting error uncertainty estimates (the "±" value in the table) for a sample are greater than calibration-imposed limits of resolution, the larger number is a more conservative indicator of composition variation and measurement error arising from differences in sample size, surface and x-ray reflection geometry.

The results of these xrf analyses can be summarized briefly. The vast majority of artifacts (n= 71; 68% of the obsidian sample total [n= 104]) from Comanche Springs derive from geologic source types (Obsidian Ridge, Cerro del Medio, Polvadera Peak, and Canovas Canyon) located in the Jemez Mountains of northern New Mexico (see Church [2000] for discussion of the availability of these obsidians in the Rio Grande gravels). Of this total, 32 specimens have the same trace element composition as obsidian of the Cerro del Medio geochemical type (a.k.a. Valles Rhyolite), 31 share the trace element profile of Obsidian Ridge (a.k.a. Cerro Toledo Rhyolite) volcanic glass, seven match the chemical signature of Polvadera Peak (a.k.a. El Rechuelos Rhyolite) obsidian, and one specimen has a trace element profile most similar to Canovas Canyon volcanic glass (Baugh and Nelson 1987: Table 1; Macdonald et al. 1992: Appendix I, p. 148; Glascock et al. 1999: Table 1; see comparative data on page seven in the accompanying data table). Thirty other samples (29% of the obsidian sample total) correspond with two obsidians (Grants Ridge and Horace Mesa [n= 15 each]) from the Mt. Taylor volcanic field of northwestern New Mexico (cf. Shackley 1998: Table 2). Two artifacts (cat. nos. 27 and 47) have the same trace element composition as volcanic glass from Government Mountain, Arizona (cf. Jack 1971), and one other specimen (cat. no. 110) has a trace element profile unlike any of the geologic obsidian standards in my current regional comparative database. The remaining five samples (cat. nos. 37, 46, 54, 89, and 108) were manufactured from non-obsidian parent material.

I hope this information will help in your analysis and interpretation of materials from this site. Please contact me at my laboratory ([650] 851-1410; e-mail: rehughes@silcon.com) if I can be of further assistance.

Sincerely,
Richard

Richard E. Hughes, Ph.D.
Director, Geochemical Research Laboratory

encl.

2006.113.6008d

REFERENCES

Anderson, Duane C., Joseph A. Tiffany, and Fred W. Nelson
1986 Recent Research on Obsidian from Iowa Archaeological Sites. **American Antiquity** 51: 837-852.

Baugh, Timothy G., and Fred W. Nelson
1987 New Mexico Obsidian Sources and Exchange on the Southern Plains. **Journal of Field Archaeology** 14: 313-329.

1988 Archaeological Obsidian Recovered from Selected North Dakota Sites and Its Relationship to Changing Exchange Systems in the Plains. **Journal of the North Dakota Archaeological Association** 3: 74-94.

Church, Tim
2000 Distribution and Sources of Obsidian in the Rio Grande Gravels of New Mexico. **Geoarchaeology** 15: 649-678.

Glascock, Michael D., Raymond Kunselman, and Daniel Wolfman
1999 Intrasource Chemical Differentiation of Obsidian in the Jemez Mountains and Taos Plateau, New Mexico. **Journal of Archaeological Science** 26: 861-868.

Hughes, Richard E.
1982 Age and Exploitation of Obsidian from the Medicine Lake Highland, California. **Journal of Archaeological Science** 9: 173-185.

1984 Obsidian Sourcing Studies in the Great Basin: Problems and Prospects. *In* Richard E. Hughes (ed.) Obsidian Studies in the Great Basin. **Contributions of the University of California Archaeological Research Facility** No. 45: 1-19.

1988a The Coso Volcanic Field Reexamined: Implications for Obsidian Sourcing and Hydration Dating Research. **Geoarchaeology** 3: 253-265.

1988b Archaeological Significance of Geochemical Contrasts Among Southwestern New Mexico Obsidians. **Texas Journal of Science** 40: 297-307.

1990 Obsidian Sources at James Creek Shelter, and Trace Element Geochemistry of Some Northeastern Nevada Volcanic Glasses. *In* Robert G. Elston and Elizabeth E. Budy (eds.), The Archaeology of James Creek Shelter. **University of Utah Anthropological Papers** No. 115, pp. 297-305.

1993 Trace Element Geochemistry of Volcanic Glass from the Obsidian Cliffs Flow, Three Sisters Wilderness, Oregon. **Northwest Science** 67: 199-207.

1994a X-ray Fluorescence Analysis of Geologic Obsidian Samples and Artifacts from the Kern River Gas Transmission Project, Utah. *In* Kern River Pipeline Cultural Resources Data Recovery Report: Utah. Volume I, Research Context and Data Analysis. Report submitted by Dames & Moore to Kern River Gas Transmission Company, January 31, 1994.

1994b Intrasource Chemical Variability of Artefact-Quality Obsidians from the Casa Diablo Area, California. **Journal of Archaeological Science** 21: 263-271.

1998 On Reliability, Validity, and Scale in Obsidian Sourcing Research. *In* Ann F. Ramenofsky and Anastasia Steffen (eds.), **Unit Issues in Archaeology: Measuring Time, Space, and Material**, pp. 103-114. University of Utah Press, Salt Lake City.

2006.113.60089

REFERENCES (continued)

Hughes, Richard E., and Fred W. Nelson
1987 New Findings on Obsidian Source Utilization in Iowa. **Plains Anthropologist** 32 (117): 313-316.

Jack, Robert N.
1971 The Source of Obsidian Artifacts in Northern Arizona. **Plateau** 43: 103-114.

Macdonald, Ray, Robert L. Smith, and John E. Thomas
1992 Chemistry of the Subalkalic Silicic Obsidians. **U.S. Geological Survey Professional Paper** 1523.

Nelson, Fred W., Jr.
1984 X-ray Fluorescence Analysis of Some Western North American Obsidians. *In* Richard E. Hughes (ed.) Obsidian Studies in the Great Basin. **Contributions of the University of California Archaeological Research Facility** No. 45: 27-62.

Shackley, M. Steven
1995 Sources of Archaeological Obsidian in the Greater American Southwest: An Update and Quantitative Analysis. **American Antiquity** 60: 531-551.

1998 Geochemical Differentiation and Prehistoric Procurement of Obsidian in the Mount Taylor Volcanic Field, Northwest New Mexico. **Journal of Archaeological Science** 25: 1073-1082.

2006.113.60089

Cat. Number	Zn	Ga	Rb	Sr	Y	Zr	Nb	Ba	Ti	Mn	$Fe_2O_3^T$	Ratio Fe/Mn	Obsidian Source (Chemical Type)
	Trace and Selected Minor Element Concentrations												
1	87	19	200	4	57	179	82	nm	nm	nm	nm	nm	Obsidian Ridge,
	±6	±3	±4	±7	±3	±4	±3						New Mexico
2	148	36	576	6	78	121	176	nm	nm	nm	nm	8	Grants Ridge,
	±6	±3	±5	±3	±3	±4	±3						New Mexico
3	80	24	199	6	57	174	82	nm	nm	nm	nm	nm	Obsidian Ridge,
	±6	±3	±4	±3	±3	±4	±3						New Mexico
4	65	17	167	8	41	171	47	nm	nm	nm	nm	nm	Cerro del Medio,
	±6	±3	±4	±3	±3	±4	±3						New Mexico
5	48	17	162	8	23	73	44	nm	nm	nm	nm	nm	Polvadera Peak,
	±6	±3	±4	±3	±3	±4	±3						New Mexico
6	60	22	173	8	41	163	48	nm	nm	nm	nm	nm	Cerro del Medio,
	±7	±3	±4	±3	±3	±4	±3						New Mexico
7	161	35	523	7	89	139	212	nm	nm	nm	nm	15	Horace Mesa,
	±7	±4	±6	±3	±4	±4	±3						New Mexico
8	57	24	157	7	41	166	44	nm	nm	nm	nm	nm	Cerro del Medio,
	±6	±3	±4	±3	±3	±4	±3						New Mexico
9	71	19	168	9	41	177	50	nm	nm	nm	nm	nm	Cerro del Medio,
	±6	±3	±4	±3	±3	±4	±3						New Mexico
10	48	22	156	7	22	72	44	nm	nm	nm	nm	nm	Polvadera Peak,
	±6	±3	±4	±3	±3	±4	±3						New Mexico
11	69	25	170	10	38	168	47	nm	nm	nm	nm	nm	Cerro del Medio,
	±7	±4	±5	±3	±3	±4	±3						New Mexico
12	171	38	549	11	90	140	211	nm	nm	nm	nm	14	Horace Mesa,
	±8	±4	±6	±3	±4	±4	±4						New Mexico
13	173	36	567	12	90	144	210	nm	nm	nm	nm	14	Horace Mesa,
	±8	±4	±7	±3	±4	±4	±4						New Mexico
14	144	32	508	9	87	141	209	nm	nm	nm	nm	15	Horace Mesa,
	±6	±3	±5	±3	±4	±4	±4						New Mexico
15	66	18	171	8	39	162	48	nm	nm	nm	nm	nm	Cerro del Medio,
	±6	±3	±4	±3	±3	±4	±3						New Mexico
16	86	25	214	5	61	174	85	nm	nm	nm	nm	nm	Obsidian Ridge,
	±6	±3	±4	±7	±3	±4	±3						New Mexico
17	71	22	179	6	41	178	49	nm	nm	nm	nm	nm	Cerro del Medio,
	±7	±3	±4	±3	±3	±4	±3						New Mexico

Values in parts per million (ppm) except total iron (in weight percent) and Fe/Mn intensity ratios; ± = estimate of x-ray counting uncertainty and regression fitting error at 300 and 600 (*) seconds livetime; nm = not measured.

2006.113-6008a

Cat. Number	Trace and Selected Minor Element Concentrations Zn	Ga	Rb	Sr	Y	Zr	Nb	Ba	Ti	Mn	$Fe_2O_3^T$	Ratio Fe/Mn	Obsidian Source (Chemical Type)
18	82 ±6	21 ±3	210 ±4	0 ±5	55 ±3	172 ±4	84 ±3	nm	nm	nm	nm	nm	Obsidian Ridge, New Mexico
19	78 ±6	17 ±3	200 ±4	5 ±4	56 ±3	167 ±4	84 ±3	nm	nm	nm	nm	nm	Obsidian Ridge, New Mexico
20	66 ±6	15 ±3	170 ±4	9 ±3	39 ±3	165 ±4	47 ±3	nm	nm	nm	nm	nm	Cerro del Medio, New Mexico
21	45 ±5	11 ±3	157 ±4	10 ±3	22 ±3	73 ±4	37 ±3	nm	nm	nm	nm	nm	Polvadera Peak, New Mexico
22	41 ±6	18 ±3	161 ±4	8 ±3	21 ±3	70 ±4	44 ±3	nm	nm	nm	nm	nm	Polvadera Peak, New Mexico
23	119 ±6	28 ±3	526 ±5	9 ±3	76 ±3	111 ±4	169 ±3	nm	nm	nm	nm	9	Grants Ridge, New Mexico
24	172 ±7	35 ±4	634 ±7	9 ±3	79 ±4	123 ±4	186 ±4	nm	nm	nm	nm	8	Grants Ridge, New Mexico
25	85 ±6	23 ±3	212 ±4	7 ±3	61 ±3	177 ±4	88 ±3	nm	nm	nm	nm	nm	Obsidian Ridge, New Mexico
26	147 ±6	31 ±3	497 ±5	9 ±3	90 ±4	138 ±4	200 ±3	nm	nm	nm	nm	14	Horace Mesa, New Mexico
27	68 ±6	19 ±3	115 ±4	81 ±3	16 ±3	82 ±4	47 ±3	328 ±14	nm	nm	nm	15	Government Mtn.
28	89 ±7	19 ±4	206 ±5	11 ±3	62 ±4	178 ±4	84 ±3	nm	nm	nm	nm	nm	Obsidian Ridge, New Mexico
29	73 ±7	25 ±3	203 ±5	7 ±3	60 ±3	180 ±4	87 ±3	nm	nm	nm	nm	nm	Obsidian Ridge, New Mexico
30	145 ±7	34 ±4	595 ±6	7 ±3	72 ±4	124 ±4	181 ±3	nm	nm	nm	nm	9	Grants Ridge, New Mexico
31	59 ±7	15 ±4	154 ±4	9 ±3	41 ±3	166 ±4	48 ±3	nm	nm	nm	nm	nm	Cerro del Medio, New Mexico
32	179 ±8	37 ±4	562 ±6	7 ±3	89 ±4	158 ±4	210 ±4	nm	nm	nm	nm	13	Horace Mesa, New Mexico
33	83 ±7	25 ±4	197 ±5	0 ±5	57 ±4	176 ±4	87 ±3	nm	nm	nm	nm	nm	Obsidian Ridge, New Mexico
34	90 ±6	22 ±3	211 ±5	8 ±3	65 ±3	178 ±4	84 ±3	nm	nm	nm	nm	nm	Obsidian Ridge, New Mexico

Values in parts per million (ppm) except total iron (in weight percent) and Fe/Mn intensity ratios; ± = estimate of x-ray counting uncertainty and regression fitting error at 300 and 600 (*) seconds livetime; nm = not measured.

2006.113.6008a

Cat. Number	Zn	Ga	Rb	Sr	Y	Zr	Nb	Ba	Ti	Mn	$Fe_2O_3^T$	Ratio Fe/Mn	Obsidian Source (Chemical Type)
	Trace and Selected Minor Element Concentrations												
35	75	25	174	7	38	174	47	nm	nm	nm	nm	nm	Cerro del Medio,
	±7	±4	±5	±3	±4	±4	±3						New Mexico
36	168	35	548	11	94	151	218	nm	nm	nm	nm	14	Horace Mesa,
	±7	±4	±6	±3	±4	±4	±3						New Mexico
37	26	7	0	213	0	20	2	nm	nm	nm	nm	nm	Not Obsidian
	±11	±4	±5	±4	±3	±5	±3						
38	82	22	190	6	51	137	83	nm	nm	nm	nm	nm	Obsidian Ridge,
	±6	±3	±4	±3	±3	±4	±3						New Mexico
39	148	32	521	9	89	147	203	nm	nm	nm	nm	15	Horace Mesa,
	±7	±3	±5	±3	±4	±4	±3						New Mexico
40	39	20	155	9	19	69	38	nm	nm	nm	nm	nm	Polvadera Peak,
	±6	±3	±4	±3	±3	±4	±3						New Mexico
41	40	11	151	8	18	69	37	nm	nm	nm	nm	nm	Polvadera Peak,
	±6	±3	±4	±3	±3	±4	±3						New Mexico
42	91	25	222	7	62	173	90	nm	nm	nm	nm	nm	Obsidian Ridge,
	±6	±3	±4	±3	±3	±4	±3						New Mexico
43	59	19	158	11	40	162	46	nm	nm	nm	nm	nm	Cerro del Medio,
	±6	±3	±4	±3	±3	±4	±3						New Mexico
44	67	19	176	9	40	165	47	nm	nm	nm	nm	nm	Cerro del Medio,
	±7	±4	±4	±3	±3	±4	±3						New Mexico
45	69	22	173	9	41	166	48	nm	nm	nm	nm	nm	Cerro del Medio,
	±6	±3	±4	±3	±3	±4	±3						New Mexico
46	23	4	7	17	1	15	0	nm	nm	nm	nm	nm	Not Obsidian
	±12	±7	±5	±3	±3	±7	±5						
47	52	26	113	75	14	87	41	294	nm	nm	nm	17	Government Mtn.
	±6	±3	±4	±3	±3	±4	±3	±13					
48	62	20	164	9	38	165	45	nm	nm	nm	nm	nm	Cerro del Medio,
	±6	±3	±4	±3	±3	±4	±3						New Mexico
49	149	30	525	9	85	143	204	nm	nm	nm	nm	14	Horace Mesa,
	±6	±3	±5	±3	±4	±4	±3						New Mexico
50	83	20	191	7	56	165	85	nm	nm	nm	nm	nm	Obsidian Ridge,
	±7	±4	±5	±3	±3	±4	±3						New Mexico
51	63	20	173	9	40	169	46	nm	nm	nm	nm	nm	Cerro del Medio,
	±7	±3	±4	±3	±3	±4	±3						New Mexico

Values in parts per million (ppm) except total iron (in weight percent) and Fe/Mn intensity ratios; ± = estimate of x-ray counting uncertainty and regression fitting error at 300 and 600 (*) seconds livetime; nm = not measured.

2006.113-6008a

Cat. Number	Zn	Ga	Rb	Sr	Y	Zr	Nb	Ba	Ti	Mn	$Fe_2O_3^T$	Ratio Fe/Mn	Obsidian Source (Chemical Type)
	Trace and Selected Minor Element Concentrations												
52	126 ±6	25 ±3	542 ±5	8 ±3	73 ±4	111 ±4	169 ±3	nm	nm	nm	nm	9	Grants Ridge, New Mexico
53	82 ±7	22 ±4	201 ±5	5 ±5	59 ±3	169 ±4	84 ±3	nm	nm	nm	nm	nm	Obsidian Ridge, New Mexico
54	20 ±18	0 ±4	0 ±5	17 ±4	0 ±5	14 ±3	0 ±3	nm	nm	nm	nm	nm	Not Obsidian
55	88 ±6	21 ±3	209 ±4	7 ±3	56 ±3	170 ±4	85 ±3	nm	nm	nm	nm	nm	Obsidian Ridge, New Mexico
56	59 ±6	19 ±3	150 ±4	8 ±3	35 ±3	146 ±4	45 ±3	nm	nm	nm	nm	nm	Cerro del Medio, New Mexico
57	58 ±6	14 ±3	150 ±4	10 ±3	36 ±3	153 ±4	46 ±3	nm	nm	nm	nm	nm	Cerro del Medio, New Mexico
58	77 ±6	21 ±3	208 ±4	7 ±3	55 ±3	171 ±4	86 ±3	nm	nm	nm	nm	nm	Obsidian Ridge, New Mexico
59	145 ±6	27 ±3	509 ±5	9 ±3	79 ±3	138 ±4	196 ±3	nm	nm	nm	nm	14	Horace Mesa, New Mexico
60	139 ±8	39 ±4	594 ±7	11 ±3	72 ±4	122 ±4	166 ±4	nm	nm	nm	nm	9	Grants Ridge, New Mexico
61	150 ±7	33 ±4	499 ±6	8 ±3	79 ±4	134 ±4	193 ±3	nm	nm	nm	nm	13	Horace Mesa, New Mexico
62	79 ±6	16 ±3	206 ±4	6 ±3	56 ±3	174 ±4	84 ±3	nm	nm	nm	nm	nm	Obsidian Ridge, New Mexico
63	133 ±6	24 ±3	492 ±5	9 ±3	79 ±4	136 ±4	190 ±3	nm	nm	nm	nm	13	Horace Mesa, New Mexico
64	139 ±6	34 ±3	598 ±6	10 ±3	76 ±4	121 ±4	176 ±3	nm	nm	nm	nm	8	Grants Ridge, New Mexico
65	126 ±6	26 ±3	564 ±5	8 ±3	76 ±3	117 ±4	172 ±3	nm	nm	nm	nm	9	Grants Ridge, New Mexico
66	173 ±7	36 ±4	606 ±6	6 ±3	79 ±4	130 ±4	181 ±3	nm	nm	nm	nm	8	Grants Ridge, New Mexico
67	144 ±6	32 ±3	508 ±5	8 ±3	81 ±3	139 ±4	196 ±3	nm	nm	nm	nm	14	Horace Mesa, New Mexico
68	61 ±6	17 ±3	180 ±4	8 ±3	40 ±3	165 ±4	43 ±3	nm	nm	nm	nm	nm	Cerro del Medio, New Mexico

Values in parts per million (ppm) except total iron (in weight percent) and Fe/Mn intensity ratios; ± = estimate of x-ray counting uncertainty and regression fitting error at 300 and 600 (*) seconds livetime; nm = not measured.

2006.113.6008a

Cat. Number	Zn	Ga	Rb	Sr	Y	Zr	Nb	Ba	Ti	Mn	$Fe_2O_3^T$	Ratio Fe/Mn	Obsidian Source (Chemical Type)
	Trace and Selected Minor Element Concentrations												
69	139	29	504	12	82	135	201	nm	nm	nm	nm	13	Horace Mesa,
	±6	±3	±5	±3	±3	±4	±3						New Mexico
70	133	35	579	9	72	119	170	nm	nm	nm	nm	8	Grants Ridge,
	±6	±3	±5	±3	±4	±4	±3						New Mexico
71	124	25	540	9	71	112	163	nm	nm	nm	nm	9	Grants Ridge,
	±6	±3	±5	±3	±3	±4	±3						New Mexico
73	135	32	593	9	77	119	167	nm	nm	nm	nm	8	Grants Ridge,
	±7	±4	±6	±3	±4	±4	±3						New Mexico
74	91	25	213	5	59	172	88	nm	nm	nm	nm	nm	Obsidian Ridge,
	±7	±3	±5	±3	±3	±4	±3						New Mexico
75	130	43	571	10	73	125	174	nm	nm	nm	nm	9	Grants Ridge,
	±8	+4	±6	±3	±4	±4	±4						New Mexico
76	69	13	179	9	37	164	47	nm	nm	nm	nm	nm	Cerro del Medio,
	±6	±4	±4	±3	±3	±4	±3						New Mexico
77	78	15	205	5	54	174	85	nm	nm	nm	nm	nm	Obsidian Ridge,
	±6	±3	±4	±4	±3	±4	±3						New Mexico
78	82	17	212	5	56	169	86	nm	nm	nm	nm	nm	Obsidian Ridge,
	±6	±4	±5	±4	±3	±4	±3						New Mexico
79	129	27	547	8	66	116	168	nm	nm	nm	nm	9	Grants Ridge,
	±6	±3	±5	±3	±3	±4	±3						New Mexico
80	121	25	556	8	71	114	164	nm	nm	nm	nm	9	Grants Ridge,
	±7	±4	±6	±3	±4	±4	±3						New Mexico
81	64	16	164	9	38	161	45	nm	nm	nm	nm	nm	Cerro del Medio,
	±6	±3	±4	±3	±3	±4	±3						New Mexico
82	84	20	194	9	55	169	83	nm	nm	nm	nm	nm	Obsidian Ridge,
	±6	±3	±4	±3	±3	±4	±3						New Mexico
83	89	17	211	7	59	174	85	nm	nm	nm	nm	nm	Obsidian Ridge,
	±6	±3	±4	±3	±3	±4	±3						New Mexico
84	56	13	158	8	39	157	46	nm	nm	nm	nm	nm	Cerro del Medio,
	±6	±4	±4	±3	±3	±4	±3						New Mexico
85	69	18	166	8	41	165	47	nm	nm	nm	nm	nm	Cerro del Medio,
	±6	±3	±4	±3	±3	±4	±3						New Mexico
86	88	21	199	7	56	176	84	nm	nm	nm	nm	nm	Obsidian Ridge,
	±7	±4	±5	±3	±4	±4	±3						New Mexico

Values in parts per million (ppm) except total iron (in weight percent) and Fe/Mn intensity ratios; ± = estimate of x-ray counting uncertainty and regression fitting error at 300 and 600 (*) seconds livetime; nm = not measured.

2006.113.6008a

Cat. Number	Trace and Selected Minor Element Concentrations											Ratio	Obsidian Source (Chemical Type)
	Zn	Ga	Rb	Sr	Y	Zr	Nb	Ba	Ti	Mn	$Fe_2O_3^T$	Fe/Mn	
87	61	20	164	6	35	158	46	nm	nm	nm	nm	nm	Cerro del Medio,
	±6	±3	±4	±3	±3	±4	±3						New Mexico
88	73	22	166	7	36	155	46	nm	nm	nm	nm	nm	Cerro del Medio,
	±7	±3	±4	±3	±3	±4	±3						New Mexico
89	74	16	10	2000	13	155	9	nm	nm	nm	nm	nm	Not Obsidian
	±14	±8	±4	±27	±6	±7	±3						
90	74	21	162	9	35	157	43	nm	nm	nm	nm	nm	Cerro del Medio,
	±7	±4	±5	±3	±3	±4	±3						New Mexico
91	60	0	160	8	35	161	44	nm	nm	nm	nm	nm	Cerro del Medio,
	±6	±3	±4	±3	±3	±4	±3						New Mexico
92	60	18	164	9	41	172	45	nm	nm	nm	nm	nm	Cerro del Medio,
	±6	±3	±4	±3	±3	±4	±3						New Mexico
93	79	23	196	5	54	168	84	nm	nm	nm	nm	nm	Obsidian Ridge,
	±6	±3	±4	±3	±3	±4	±3						New Mexico
94	71	19	163	7	38	162	49	nm	nm	nm	nm	nm	Cerro del Medio,
	±6	±3	±4	±3	±3	±4	±3						New Mexico
95	81	23	208	7	58	172	88	nm	nm	nm	nm	nm	Obsidian Ridge,
	±6	±3	±4	±3	±3	±4	±3						New Mexico
96	57	15	159	8	43	152	48	nm	nm	nm	nm	nm	Cerro del Medio,
	±7	±4	±4	±3	±3	±4	±3						New Mexico
97	58	18	160	9	38	157	46	nm	nm	nm	nm	nm	Cerro del Medio,
	±6	±3	±4	±3	±3	±4	±3						New Mexico
98	88	19	207	6	57	170	83	nm	nm	nm	nm	nm	Obsidian Ridge,
	±7	±4	±5	±3	±4	±4	±3						New Mexico
99	38	9	122	41	18	110	45	347	nm	nm	nm	15	Canovas Canyon,
	±7	±4	±4	±3	±3	±4	±3	±14					New Mexico
100	73	21	194	6	57	171	87	nm	nm	nm	nm	nm	Obsidian Ridge,
	±6	±3	±4	±3	±3	±4	±3						New Mexico
101	56	14	170	9	42	164	49	nm	nm	nm	nm	nm	Cerro del Medio,
	±6	±3	±4	±3	±3	±4	±3						New Mexico
102	83	25	207	6	62	174	86	nm	nm	nm	nm	nm	Obsidian Ridge,
	±7	±4	±5	±3	±4	±4	±3						New Mexico
103	61	16	160	11	41	164	45	nm	nm	nm	nm	nm	Cerro del Medio,
	±6	±3	±4	±3	±3	±4	±3						New Mexico

Values in parts per million (ppm) except total iron (in weight percent) and Fe/Mn intensity ratios; ± = estimate of x-ray counting uncertainty and regression fitting error at 300 and 600 (*) seconds livetime; nm = not measured.

2006.113.6008a

Cat. Number	Zn	Ga	Rb	Sr	Y	Zr	Nb	Ba	Ti	Mn	$Fe_2O_3^T$	Ratio Fe/Mn	Obsidian Source (Chemical Type)
	Trace and Selected Minor Element Concentrations												
104	163	34	545	10	83	145	203	nm	nm	nm	nm	13	Horace Mesa,
	±6	±3	±5	±3	±4	±4	±3						New Mexico
105	87	21	193	6	57	167	84	nm	nm	nm	nm	nm	Obsidian Ridge,
	±6	±3	±4	±3	±3	±4	±3						New Mexico
106	73	20	191	6	57	166	83	nm	nm	nm	nm	nm	Obsidian Ridge,
	±6	±3	±4	±3	±3	±4	±3						New Mexico
107	80	25	192	7	52	173	85	nm	nm	nm	nm	nm	Obsidian Ridge,
	±5	±3	±4	±3	±3	±4	±3						New Mexico
108	25	4	0	9	0	14	0	nm	nm	nm	nm	nm	Not Obsidian
	±7	±38	±5	±4	±4	±3	±4						
109	41	15	158	6	18	72	43	nm	nm	nm	nm	nm	Polvadera Peak,
	±6	±3	±4	±3	±3	±4	±3						New Mexico
110	34	14	116	61	19	113	35	809	nm	nm	nm	nm	Unknown
	±6	±3	±4	±3	±3	±4	±3	±13					
	Selected Comparative Geologic Reference Standards												
PP-L2-3a	36	16	149	8	22	71	39	nm	500	482	.64	13	Polvadera Peak,
	±6	±3	±4	±3	±3	±4	±3		±15	±11	±.10		New Mexico
PP-L2-4a	39	21	145	7	20	67	40	nm	497	457	.63	13	Polvadera Peak,
	±5	±3	±4	±3	±3	±4	±3		±14	±11	±.10		New Mexico
LT-4	53	19	151	7	38	157	48	nm	577	447	1.20	26	Cerro del Medio,
	±5	±3	±4	±3	±3	±4	±3		±16	±11	±.10		New Mexico
CA-2	67	26	159	8	41	156	49	nm	521	430	1.12	26	Cerro del Medio,
	±5	±3	±4	±3	±3	±4	±3		±16	±11	±.10		New Mexico
GS6A-1	86	18	191	4	56	159	82	nm	440	596	1.17	20	Obsidian Ridge,
	±6	±3	±4	±3	±3	±4	±3		±14	±9	±.08		New Mexico
GS8-2	87	20	193	4	58	156	84	nm	451	600	1.19	21	Obsidian Ridge,
	±5	±3	±4	±3	±3	±4	±3		±14	±8	±.08		New Mexico
G-4	138	27	533	5	77	111	180	nm	183	989	.88	8	Grants Ridge,
	±6	±3	±5	±3	±3	±4	±3		±13	±12	±.10		New Mexico
G-5	160	30	506	6	89	135	218	nm	165	698	.99	14	Horace Mesa,
	±6	±3	±5	±3	±3	±4	±3		±13	±11	±.10		New Mexico
CC-2	38	16	122	38	17	100	48	332	727	518	.80	15	Canovas Canyon,
	±6	±3	±4	±3	±3	±4	±3	±12	±17	±11	±.10		New Mexico

Values in parts per million (ppm) except total iron (in weight percent) and Fe/Mn intensity ratios; ± = estimate of x-ray counting uncertainty and regression fitting error at 300 and 600 (*) seconds livetime; nm = not measured.

Appendix C

RADIOCARBON REPORTS

BETA ANALYTIC INC.

DR. M.A. TAMERS and MR. D.G. HOOD

UNIVERSITY BRANCH
4985 S.W. 74 COURT
MIAMI, FLORIDA, USA 33155
PH: 305/667-5167 FAX: 305/663-0964
E-MAIL: beta@radiocarbon.com

REPORT OF RADIOCARBON DATING ANALYSES

Dr. Ann F. Ramenofsky — Report Date: October 7, 1999

University of New Mexico — Material Received: August 26, 1999

Sample Data	Measured Radiocarbon Age	^{13}C / ^{12}C Ratio	Conventional Radiocarbon Age (*)
Beta-133651	220 +/- 50 BP	-23.2 o/oo	250 +/- 50 BP

SAMPLE #: FS #5055
ANALYSIS: radiometric-standard
MATERIAL/PRETREATMENT:(charred material): acid/alkali/acid

NOTE: It is important to read the calendar calibration information and to use the calendar calibrated results (reported separately) when interpreting these results in AD/BC terms.

Dates are reported as RCYBP (radiocarbon years before present, "present" = 1950A.D.). By International convention, the modern reference standard was 95% of the C14 content of the National Bureau of Standards' Oxalic Acid & calculated using the Libby C14 half life (5568 years). Quoted errors represent 1 standard deviation statistics (68% probability) & are based on combined measurements of the sample, background, and modern reference standards.

Measured C13/C12 ratios were calculated relative to the PDB-1 international standard and the RCYBP ages were normalized to -25 per mil. If the ratio and age are accompanied by an (*), then the C13/C12 value was estimated, based on values typical of the material type. The quoted results are NOT calibrated to calendar years. Calibration to calendar years should be calculated using the Conventional C14 age.

2006.113.6002a

2006.113.6602a

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-23.2:lab. mult=1)

Laboratory number: **Beta-133651**

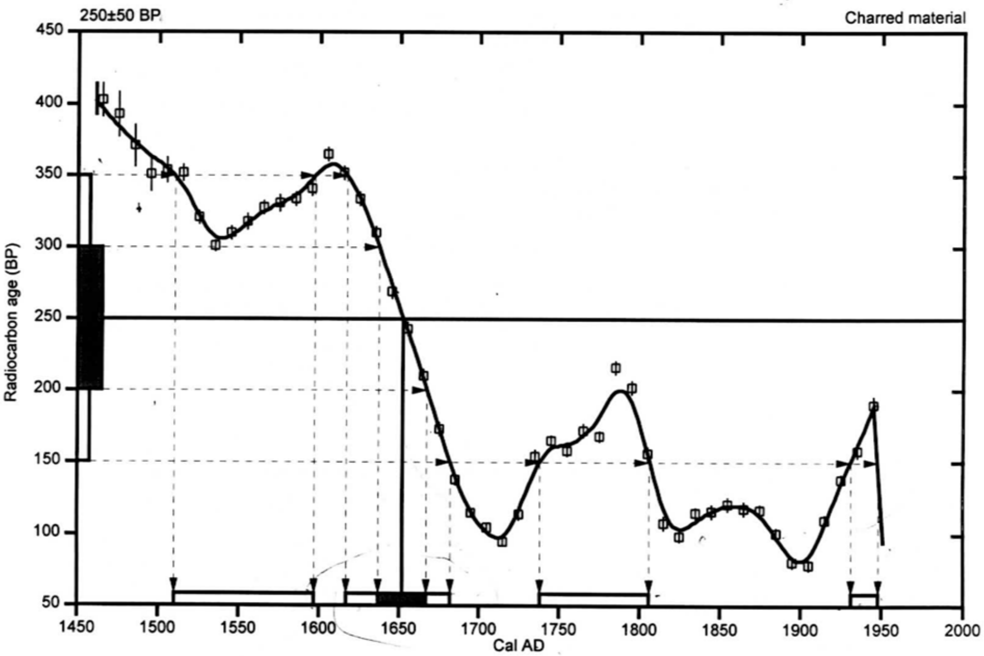
Conventional radiocarbon age: **250±50 BP**

2 Sigma calibrated results: (95% probability)
Cal AD 1510 to 1595 (Cal BP 440 to 355) and
Cal AD 1615 to 1680 (Cal BP 335 to 270) and
Cal AD 1740 to 1805 (Cal BP 210 to 145) and
Cal AD 1930 to 1950 (Cal BP 20 to 0)

Intercept data

Intercept of radiocarbon age with calibration curve: Cal AD 1650 (Cal BP 300)

1 Sigma calibrated result: (68% probability) Cal AD 1635 to 1665 (Cal BP 315 to 285)



References:

Database used
INTCAL98
Calibration Database
Editorial Comment
Stuiver, M., van der Plicht, H., 1998, Radiocarbon 40(3), pxii-xiii
INTCAL98 Radiocarbon Age Calibration
Stuiver, M., et. al., 1998, Radiocarbon 40(3), p1041-1083
Mathematics
A Simplified Approach to Calibrating C14 Dates
Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2), p317-322

Beta Analytic Radiocarbon Dating Laboratory

4985 S.W. 74th Court, Miami, Florida 33155 • Tel: (305)667-5167 • Fax: (305)663-0964 • E-mail: beta@radiocarbon.com

BETA

BETA ANALYTIC INC.

DR. M.A. TAMERS and MR. D.G. HOOD

UNIVERSITY BRANCH
4985 S.W. 74 COURT
MIAMI, FLORIDA, USA 33155
PH: 305/667-5167 FAX: 305/663-0964
E-MAIL: beta@radiocarbon.com

REPORT OF RADIOCARBON DATING ANALYSES

Dr. Ann F. Ramenofsky — October 26, 1998

University of New Mexico — November 23, 1998

Sample Data	Measured C14 Age	C13/C12 Ratio	Conventional C14 Age (*)
Beta-123695	490 +/- 60 BP	-20.9 o/oo	560 +/- 60 BP

SAMPLE #: LA 14904
ANALYSIS: radiometric-standard
MATERIAL/PRETREATMENT:(charred material): acid/alkali/acid

NOTE: It is important to read the calendar calibration information and to use the calendar calibrated results (reported separately) when interpreting these results in AD/BC terms.

Dates are reported as RCYBP (radiocarbon years before present, "present" = 1950A.D.). By International convention, the modern reference standard was 95% of the C14 content of the National Bureau of Standards' Oxalic Acid & calculated using the Libby C14 half life (5568 years). Quoted errors represent 1 standard deviation statistics (68% probability) & are based on combined measurements of the sample, background, and modern reference standards.

Measured C13/C12 ratios were calculated relative to the PDB-1 international standard and the RCYBP ages were normalized to -25 per mil. If the ratio and age are accompanied by an (*), then the C13/C12 value was estimated, based on values typical of the material type. The quoted results are NOT calibrated to calendar years. Calibration to calendar years should be calculated using the Conventional C14 age.

2006.113 60029

2006.113.6002a

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables:C13/C12=-20.9:lab mult.=1)

Laboratory Number: Beta-123695

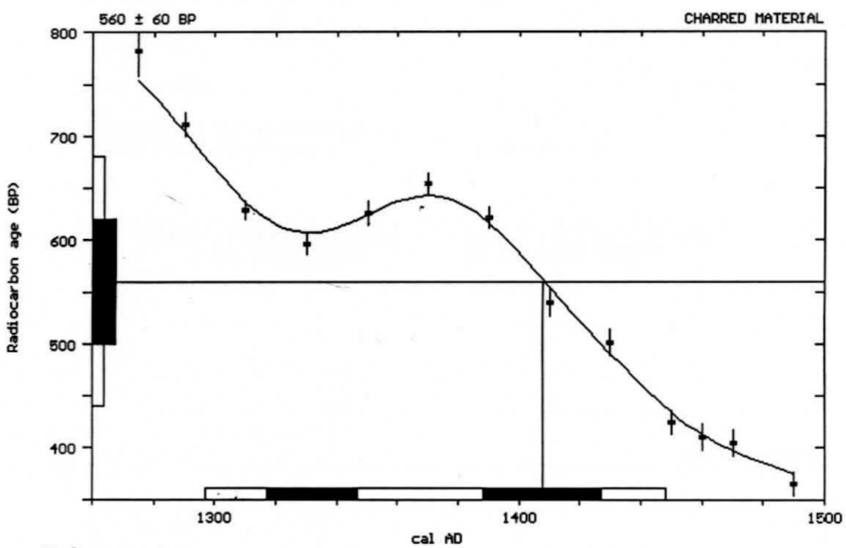
Conventional radiocarbon age: **560 ± 60 BP**

Calibrated results: **cal AD 1295 to 1450**
(2 sigma, 95% probability)

Intercept data:

Intercept of radiocarbon age with calibration curve: cal AD 1410

1 sigma calibrated results: cal AD 1315 to 1345 and
(68% probability) cal AD 1390 to 1425



References:

Pretoria Calibration Curve for Short Lived Samples
Vogel, J. C., Fuls, A., Visser, E. and Becker, B., 1993, Radiocarbon 35(1), p73-86
A Simplified Approach to Calibrating C14 Dates
Talma, A. S. and Vogel, J. C., 1993, Radiocarbon 35(2), p317-322
Calibration - 1993
Stuiver, M., Long, A., Kra, R. S. and Devine, J. M., 1993, Radiocarbon 35(1)

Beta Analytic Radiocarbon Dating Laboratory

4985 S.W. 74th Court, Miami, Florida 33155 ▪ Tel: (305)667-5167 ▪ Fax: (305)663-0964 ▪ E-mail: beta@radiocarbon.com

Appendix D

DEAN REPORT ON DENDROCHRONOLOGY

Laboratory of
Tree-Ring Research

THE UNIVERSITY OF
ARIZONA®
TUCSON ARIZONA

P.O. Box 210058
Tucson, Arizona 85721-0058
Phone: (520) 621-6469
FAX: (520) 621-8229

26 April 1999

Dr. Ann F. Ramenofsky
Department of Anthropology
The University of New Mexico
Albuquerque, New Mexico 87131-1086

Re: Accession A-1425

Dear Ann,

Enclosed is a species identification form resulting from our analysis of 44 archaeological tree-ring samples from LA 14904. Also enclosed is an invoice for our minimum charge ($150.00) to cover the cost of the analysis. Because most of the samples have too few rings for dating, the work took less time than normally would be the case. I can't remember if we discussed payment for this analysis. If we agreed to do it for nothing, simply discard the invoice.

All the samples are ponderosa pine, and, as with the previous submission, most of them have too few rings (9 to 25) to be dated. Two FN numbers appearing together means that both field samples came from the same tree. Multiple listings of the same FN (as with 5008) represent pieces from different trees that were assigned one number. Counts exceeding one (as for 5036) specify pieces from different trees that were included under one field number.

Although not immediately dated, 15 samples (NMO 4-18) have enough dendrochronological potential to be added to our permanent collection for future reference. The technician who analyzed this material feels that with more comparative material and better chronological control, some of these samples probably will date. Therefore, when additional material becomes available for this area and time period and/or we upgrade our local master chronologies, we will reexamine the samples from LA 14904 for crossdating with the new material.

I am returning the uncatalogued samples to you separately.

If you have any questions about these results, please let me know.

Sincerely,

Jeff

Jeffrey S. Dean

LABORATORY OF TREE-RING RESEARCH

SITE: Comanche Springs (LA 14904) ACCESSION NO: A-1306

Species ID By: RLW Date: 1/6/97 Page 1 of 2

Field Number	DF	PP	PNN	JUN	S/F	POP	QUER	Non-Con	Comments
		1							NMO-1
		1							NMO-2, short
		1							NMO-3, short
1		1							12 rings
2		1							7 rings
3		1							16 rings
4		1							6 rings
5		1							9 rings
6		1							17 rings
7		1							19 rings
8		1							7 rings
9		1							15 rings
10		1							11 rings
11		1							12 rings
12		1							9 rings
13		1							6 rings
14		1							16 rings
15		1							17 rings
16		1							12 rings
17		1							9 rings
18		1							13 rings
19		1							11 rings
20		1							13 rings
21		1							19 rings
22		1							9 rings
23		1							13 rings
24		1							6 rings
25		1							7 rings
26		1							20 rings
27		1							5 rings
28		1							11 rings
29		1							8 rings
30		1							20 rings
31		1							14 rings
32		1							19 rings
33		1							14 rings
		36							

LABORATORY OF TREE-RING RESEARCH

SITE: Comanche Springs (LA 14904) ACCESSION NO: A-1306

Species ID By: RLW Date: 1/6/97 Page 2 of 2

Field Number	DF	PP	PNN	JUN	S/F	POP	QUER	Non-Con	Comments
34		1							11 rings
35		1							20 rings
36		1							11 rings
37		1							7 rings
38		1							14 rings
39		1							9 rings
40		1							10 rings
41		1							5 rings
42		1							17 rings
43		1							14 rings
44		3							Same as NMO-1
45		1							Same as NMO-2

14

Appendix E

FEATHERS REPORT ON THERMOLUMINESCENCE DATING[1]

THERMOLUMINESCENCE DATING OF POTTERY FROM COMANCHE SPRINGS, NEW MEXICO

Six pottery sherds collected from the remains of two adobe structures at Comanche Springs were submitted for luminescence analysis by Ann Ramenofsky, Department of Anthropology, University of Mexico. The site is believed to be a Spanish ore processing station dating to the late 17th century. Two pieces of slag were also submitted for luminescence assay, but these will be addressed in a separate report. Table 1 gives the samples and contexts. Salinas Red is a Spanish colonial ware (European form, native technology) thought to date between 1625 and 1680. The majolica piece, an "olive jar", is thought to be of European origin. Biscuit is a late Puebloan pottery type. UW410 consisted of two sherds that could be fit together. They were treated as one sample.

Table 1

Laboratory number	Archaeological designation	Ceramic type	Context
UW408	FS 219	Salinas Red	East of structure C
UW409	FS 237	Salinas Red	East of structure C
UW410	FS 225/238	Salinas Red	East of structure C
UW411	FS 5117	Salinas Red	Structure A
UW412	FS 231	Spanish majolica	Structure C
UW413	FS 265	Biscuit	Structure C

Attached are the procedures followed for dating the sherds. None of the sherds posed any particular problems in preparation or measurement.

Figure 1 shows the results of the anomalous fading test. Since all aliquots were stored for at least one week after irradiation, the key feature of these graphs is evidence for fading after one week (about 10,000 minutes). Such evidence is most apparent for UW410, which shows steady fading with time (with the exception of one outlying value). Fading is probably also present for UW413, although some scatter makes the results more ambiguous. Slight fading may also present for UW408. While the other samples show some fading, it seems to be completed after one week storage. The dates for UW410, UW413 and UW408 should be considered minimums.

Figures 2 and 3 show the plateau tests for equivalent dose and b-value. As can be seen, the plateaus are relatively broad, indicating well-fired, well-behaved samples. The scatter in the growth curves (Figure 4) is also low. Figure 4 shows the additive dose and regeneration curves after shifting from the slide analysis. Figure 5 shows the slopes of additive dose curves using beta or alpha irradiation. The ratio of these slopes is used to correct for alpha efficiency (by the b-value method). Equivalent dose, b-value and other pertinent data are given in the attached data sheets.

[1] The section on methods and the plots are excluded, but are available at the Maxwell Museum archives.

Table 2 gives radioactivity data, as collected by alpha counting and flame photometry. Dose rates are given on the data sheets. The radioactivity of all the sherds, except for UW413, are quite similar, and not that much different from the adjacent sediments. UW413 is obviously made from different clays and could be an imported item. The similarity in radioactiviy of UW412 to the other sherds is remarkable given the alleged European origin of this pottery. A question might be posed whether this pottery was made using European techniques but with local clays.

Table 2

Sample	U (ppm of ^{238}U)	Th (ppm of ^{232}Th)	K (%)
UW408 – sherd	3.69±0.25	9.64±1.20	1.79±0.06
Sediment	2.31±0.17	6.08±1.03	1.48±0.02
UW409 – sherd	3.71±0.24	6.90±1.11	1.83±0.01
Sediment	2.59±0.18	5.48±0.96	1.48±0.01
UW410 – sherd	3.28±0.22	7.34±1.14	1.90±0.03
Sediment	2.10±0.17	7.33±1.11	1.49±0.03
UW411 – sherd	1.31±0.15	10.30±1.30	1.23±0.01
Sediment	2.62±0.18	6.32±1.03	1.42±0.01
UW412 – sherd	3.57±0.24	8.26±1.22	1.87±0.01
Sediment	2.34±0.17	6.06±1.03	1.29±0.01
UW413 – sherd	5.11±0.36	17.42±1.74	2.67±0.08
Sediment	2.01±0.17	8.49±1.22	1.38±0.03

Table 3 gives the derived ages. Because anomalous fading affects the other samples, the most reliable dates are from UW409, UW411 and UW412. This puts the occupation of the site between about AD1650 and AD1685. Weighted average of those three is AD1667±21. The earlier date for UW412 may reflect that it was produced (in Europe) somewhat earlier than the occupation, although not too much can be made of this, since it could have been subject to New World firing. Also the errors overlap, and an uncertain external dose rate for the sherd prior to its deposition will produce some minor, but unknown systematic error. The dates agree with earlier assessments of the age for these ceramic types.

Table 3

Sample	Age (years AD)
UW408	1713±27
UW409	1666±28
UW410	1805±34
UW411	1683±32
UW412	1655±28
UW413	1850±15

James Feathers
Luminescence Dating Laboratory
University of Washington
Seattle, WA

MAY 24, 2000

Appendix F

EXPLORING THE NATURE OF HYBRID COMMUNITIES IN 17th CENTURY NEW MEXICO: COMANCHE SPRINGS

Ann F. Ramenofsky

[This appendix includes a scanned version of the prepared paper and PowerPoint slides for Ramenofsky's presentation to the Society for Historical Archaeology 2010 Conference. Please note the following changes; because the paper was scanned, the changes were not entered directly.

This Report	**Scanned Paper**	**Para-graph**	**Reads**	**Should Read**
P. 85	P. 3	4	"(Figure 5)"	"(Figure 6)"
P. 85	P. 3	4	"(Figure 6)"	"(Figure 7)"
P. 86	P. 4	1	"(Figure 7)"	"(Figure 8)"
P. 86	P. 4	3	"(Figure 8)"	"(Figure 9)"
P. 86	P. 4	3	"... and copper assaying."	"...and copper assaying (Figures 9 and 10)."
P. 87	P. 5	2	"(Figure 9)"	"(Figure 11)"
P. 87	P. 5	3	"... of the native ceramics."	"...of the native ceramics (Figure 12."
P. 87	P. 5	4	"(Figure 11)"	"(Figure 13)"
P. 87	P. 5	4	"(Figure 12)"	"(Figures 13 and 14)"
P. 88	P. 6	1	"(Figure 13)"	"(Figure 15)"
P. 88	P. 6	4	"(Figure 14)"	"(Figure 16)"

The tables on Page 96 of this report, appearing on Pages 14 and 15 of the original paper, were re-entered during report production.

— *Series Editor*]

EXPLORING THE NATURE OF HYBRID COMMUNITIES in 17th CENTURY NEW MEXICO: COMANCHE SPRINGS

Presented in SHA Symposium: ARCHAEOLOGY IN THE BORDERLANDS WEST: 300 YEARS Of INTERCULTURAL CONNECTIONS, ORGANIZED BY ASHLEY PELES

ANN F. RAMENOFSKY
UNIVERSITY OF NEW MEXICO

In recent decades questions of ethnicity and identity have loomed large in archaeological inferences. Such concerns seem, on the surface, to be well suited to historic period investigations in the Americas. The Columbian voyages ushered in entanglements between peoples of dramatically different ethnicities. Moreover, vast differences in the technological traditions of peoples from different hemispheres creates a situation where artifacts and technological recipes can become identity markers of separate traditions and peoples. These strengths however, also have serious liabilities.

First is the difference between ethnological and archaeological research on ethnicity. More than 50 years ago, Barth (1969) characterized ethnicity as a social process of ascription and self-ascription. He viewed ethnic groups as mutable and defined by the boundaries , not the stuff that within them. By contrast, archaeological ethnicity, even when documents aid in potential identification, begins with stuff and categorical distinctions. But, identifying ethnic groups by artifacts is problematic. Human behavior is more flexible and creative than the bits and pieces of archaeology. Spanish households may be characterized by, for instance, comals, native ceramics, and a few majolica or olive jar sherds, but the presence of these artifacts does not necessarily signify a Spanish enclave. Artifacts can be traded; people can change their traditions or adopt new ones and, as repeatedly documented, mix their previously separate gene pools (Brooks 2002).

As a conceptual framework, ethnogenesis incorporates many of attractive aspects of ethnicity but, unlike the latter, does not necessitate categorical distinctions. In addition, ethnogenesis is a longer, time transgressive process and amenable to archaeological investigations. Rather than beginning with ethnic labels such as Spanish, Mestizo , Genizaro, or Indian, the social composition can become the research focus to be inferred from the analysis of materials and documents, if such are available. In this end, such a focus removes some of the circularity involved with strict archaeological ethnic investigations.

Here I consider the social composition of one settlement, Comanche Springs, located in Rio Abajo in south central New Mexico (Figure 1). The place is a hybrid community that I believe represents an ethnogenetic expression of seventeenth century New Mexico. It is neither Spanish with a light sprinkling of native artifacts nor Native with a dusting of Spanish elements. Both Spanish and Native elements are present in equal numbers at Comanche Springs . It is this eq uality that incapsulates and represents the evolution of historic New Mexico. Unfortunately, there is nothing in the archaeological record to suggest whether and how these diverse ethnic groups were intereacting. Moreover, because the community was small and unobtrusive, there is no historical documentation to aid in elucidation. On the positive side, however, the variability of the assemblage is exactly what I would expect regarding new beginnings in a colony that was "remote beyond compare" (Kessell 1989).

In what follows, I offer Comanche Springs as one example of ethnogenesis. I do so by I first considering some of the archaeology from CS and turn my attention to the ssues of ethnogenesis.

Essential Background

My interest in Comanche Springs began when the Maxwell Museum staff asked that I examine slag samples from the settlement that had been collected by Frank Hibben. Hibben had excavated at Comanche Springs in the 1960s and 1970s, and suggested that it was an early sixteenth-century Spanish settlement and silver assay station established by Don Juan de Oñate (Hibben, et al. 1985). He also suggested that Indians were members of the settlement, and that they were slaves of the Spaniards. These statements were enough to peak my interest.

Comanche Springs is an isolated settlement, located at the edge of the Manzano Mountains in a region that is relatively poor in metal minerals (Vaughan 2006). Tomé, the nearest known settlement , was located 21 km to the west--- roughly a day's travel in the seventeenth century (Figure 1). Structurally, Comanche Springs is composed of the footprints of three relatively small houses (noted A, B, and C)all of which contained evidence of domestic activity (Figure 2). The houses were dispersed across 6 hectares on a north-south axis and bisected by at least one permanent spring (Figure 3). There was no plaza, or other obvious public space that could have united the community.

Although the physical layout accords well with Nostrand's ideas of seventeenth century dispersed settlements in New Mexico (Nostrand 1992; Simmons 1969), I wasn't sure whether all structures were the same age. Accordingly, dating become a first priority and included dendrochronology, luminescence and radiocarbon with samples drawn from two different structures. (Table 1). The radicarbon dates documented a pre-contact deposit, as well as mid-late seventeenth century occupation. (Figure 4) Luminescence dates of Salinas Ware soup plates and one olive jar fragment pointed to a mid-late seventeenth century affiliation. Based on the evidence, I concluded that Comanche Springs was built and occupied as a single settlement inhabited for relatively brief period from the early to mid Seventeenth century until the Pueblo Revolt.

Assemblage Composition

As is apparent from Table 2 (and Figure 5) , the material categories recovered from Comanche Springs are more or less evenly divided between presumably Spanish or Native traits.

First--- regarding architecture: Although there were no standing walls, structural footings were massive, minimally double coursed, and Spanish in design (Figure 5). Between the larger cobbles with smaller chinking stones and, in some places, adobe mortar was visible. In Structure C, a similarly built wall divided the building into north and south sections. Also there were mold made adobe bricks, measuring approximately 77 cm^2 and , like the footings, were clearly of Spanish origin. My analysis suggested that the buildings were erected directly on top of clay rich Cienega soils that were hard packed but not sealed by blood (Figure 6).

In terms of ceramics, Majolicas and olive jar sherds were evidence of Spanish presence (Figure 7). The total sample was approximately 140 pieces. Puebla Blue on White and Puebla Polychrome were the most abundant types and, according to Deagan (Deagan 1987), date to mid-seventeenth to mid-eighteenth century.

I was intensively interested in the question of metal extraction at Comanche Springs both because we know very little about early metal production in the colony (Ramenofsky, et al. 2008) and because of the remote location of the settlement. Hibben had recovered evidence fire smelting, and had likely excavated through a smelter located outside Structure B. His analysis of the several pieces of slag suggested silver extraction. If this were case, it would make Comanche Springs a very significant location. There are no definite silver mining areas reported from the Manzanos, and the presence of trace amounts of silver in a slag does not translate silver smelting. Moreover, Vaughan's exhaustive research of seventeenth century metal production turned up only one clear example of silver smelting , and that derived from Santa Fe (Vaughan 2006).

A deliberate search for metallurgical processing was undertaken, and three features located east of Structure C were discovered, and suggested both assaying or smelting (Figure 9). Although no metal artifacts were located, the features and the slag suggested a number of metallurgical activities. High quantities of air-chill iron spatter or hammer scale recovered from one feature suggested either bloomery iron smelting, smithing, or forging (Figure 8). A second feature that contained metallurgical slag and a small concentration of copper ore was more difficult to interpret. The feature was extremely shallow, highly oxidized. SEM analysis of the slag samples suggested bloomery iron smelting and copper assaying.

The metallurgical evidence from Comanche Springs is an important contribution to our developing knowledge of metallurgical production during the early colonial period (Figure 8). Compared with metallurgical debris from other seventeenth century smelters in New Mexico (which themselves are rare), the evidence of metal working at Comanche Springs is clearly utilitarian. Because metal of all types, but especially iron, was rare in the colony, the inhabitants at Comanche Springs worked and reworked metal for the purpose of survival. They do not appear to have been trying to accumulate personal wealth. Such knowledge contrasts strongly to the earlier interpretation of Comanche Springs as a silver assaying station.

Clay figurines of presumably Spanish origin are the last material class to consider (Figure 9). All were small and hand molded. The male figurine is exceptionally well proportioned and looks more like a seventeenth-century Italian male than a Puebloan figure. The small horse is similarly well-proportioned and (although not shown here) included a saddle that fit perfectly on the horse's back. Although these items could have been made by Native artisans, they differ dramatically from the small native ceramic heads to be discussed shortly.

The native side of the artifact inventory at Comanche Springs archaeology that included ceramics, lithics, and the ceramic heads. In terms of counts, native ceramics were far more common than Majolica (Figure 10). The total sample of ceramics exceed 500 sherds. Although some Glaze-Paint or Biscuit ware body sherds were recovered, the bulk of the native ceramics were utility wares, either Salinas Red , polished blackware or plain grey utility taken from all domestic locations. The high quantity of Salinas types makes considerable sense in that the missions were located east of Abo Gap, about 64 km from the settlement. Colonoware soup plates and ring bases constituted a small proportion of the native ceramics . As described above some of these soup plates were used in establishing the age of the settlement.

(Figure 11) During the excavation, we uncovered a set of three superimposed, unique features from Structure A that appear to be of native construction and are unlike any others I have ever recovered. The set of features was embedded in and/or covered by adobe (Figure 12). At the top was a double line of small fire fractured rock, cobles, or comals embedded in adobe. The adobe continued below the first feature and sealed a pit that was put in place prior the adobe capl or the building of structure A. The pit contained half a Salinas Redware soup plate and four small, hand-molded adobe bricks (Figure 13). The bricks were lying parallel to each other on their edges and nestled against the soup plate. The surfaces of these there bricks were covered with first a hematite coat and them a coat of lime plaster. One part of the Salinas soup plate was used in luminescence dating an returned an age estimate of 1683 $\pm$ 32.

The stratigraphy and nature of these features suggests they were constructed as a single event. First, the pit was excavated and filled with artifacts perhaps when this part of structure was erected in the later half of the seventeenth century. Following construction, the pit was sealed with a thick layer of adobe. At the top of the adobe platform, the linear array of cobbles were set in place

Although the features had the "feel" of domestic activity, there are no direct or indirect analogues for suggesting their function or significance. The pit feature may have been a kind of private offering or signal that this structure was "Native". If this part of the structure was connected with the cocina, then perhaps a woman created the offering. What is clear, is that once constructed, the contents were hidden. Regarding the cobble feature, Ellis briefly described similar small features set in adobe from San Gabriel del Yungue. She defined them as stone tables associated with cooking (Ellis 1989). The size of the single cobble feature at Comanche Springs is within the range Ellis described. Such an interpretation is possible in light of E. Boyd's descriptions of chimney hoods common historically in Spanish colonial kitchens (Boyd 1974). The hoods were constructed of wood with the uprights set into or beneath the floors. In the unit directly west of this feature, a large post-mold was excavated.

The clay heads are the last part of the assemblage to be considered (Figure 14). All the heads are small and constructed of clay coils to which facial features have been added. In several cases, the jaw and neck are minimally sculpted. One of the heads also has eye brows outlined. Several of these heads match descriptions of Kidder's from Pecos (Kidder 1932), and several ressemble Kachina masks found on petroglyph displays from southern New Mexico (Munson 2002; Schaafsma 1994). Although all these figurines were found in eroding erosional surfaces both inside and outside structures, nor further contextual information is available. On the other hand, the construction, and features of these heads suggest Native not Spanish manufacture.

Social Composition

In this discussion, I have emphasized that the material record of Comanche Springs is both Spanish and Native. Archaeology, however, is the skeleton of interaction, and to round out this narrative requires that we move from the physical record and consider source populations, and ethnic relations of the community. After all it is the interactions that forged the American society (Axtell 1988).

Given the size of the settlement, the population at Comanche Springs must have been small. Assuming that each structure represented a household, there were three households at the settlement. Using family size from the muster roll of the Pueblo Revolt as an estimate for household size (Hackett 1942) suggests that the mean size of the community may have been 50 individuals. Importantly, there is no evidence in the material record that Spaniards and Natives lived in different structures or were otherwise separated. The same suite of artifacts were recovered from the structures despite the differences in counts. This finding suggests some degree of integration or cooperation. In this small community, perhaps Natives and Spaniards were "getting by" because of their cooperation.

Colonists, likely related to each other, made up the Spanish component of the community. Given that the structures appear to be Spanish, this group likely arrived first. Several source populations for the Spanish are possible. First, given the evidence of metal production, the Spanish colonists may have miners from the Parral District in Mexico. Parral is not that far south, and the immigrants could have traveled north along the Camino Real. Other possible sources of the Spanish component of Comanche Springs are Tome and the Salines. There is documentary evidence that an individual land grant was awarded to Tomé Dominguez de Menoza in the 1660s, but there is no archaeological trace of the presence of a grant in the Tomé area. If, indeed, there was a 17th century grant at Tome, then some of the relatives could have moved to Comanche Springs because of the water.

On the other hand, the Salines are another possible source for the Spanish. One of Mendoza's relatives was living in the area at the time of the Revolt (Scurlock, et al. 1995). Moreover, Ivey records that after 1630, there were a number of estancias in the Salines located between Quarai and Gran Quivira and that, at Abó, footprints of a Spanish block house, corrals and storage facilities were identified (Ivey 1988) . Perhaps some of these individuals moved west from the Salines to Comanche Springs.

The link between the Salines and Comanche Springs seems stronger as the source population for the native peoples. Although the traditional and colono ware could be the result of trade between the two areas, the presence of the ceramic heads changes that possibility. I doubt that figures were traded. It seems far more likely that Pueblo peoples carried the heads with them when they moved to Comanche or simply manufactured them after migrating. If I'm right about this, then, the question is what was the nature of the interaction between the Native and Spanish components of the settlement? Once again, there are a number of possibilities.

The institution of Indian slavery encapsulates both source and relationship. Brooks (Brooks 2002) has argued that kin-based slavery was a Spanish social institution in New Mexico and that men were the dealers who traded women and children, especially from non-Pueblo groups. He further suggests that by the late-seventeenth century, Indian slaves likely accounted for approximately one-firth of the colony, becoming a contributing factor of the Pueblo Revolt. Although, from a European perspective, kin-based slavery is more opened-ended and less onerous for the enslaved than chattel slavery, Flint (Flint 2002) has insightfully observed that this technical distinction may have been lost on native people who were forcibly taken and sold.

Intermarriage or, at least, sexual liaisons between Spanish men and Indian women is a second source for Native representation at Comanche Springs. The seeming consistency of the material record at the settlement makes this possibility attractive, as does the unique soup plate-adobe brick feature excavated from Structure A. As in other colonial contexts (Deagan 1983) , males outnumbered females during the early Colonial period (Flint 2003) with Native women as the source for adjusting the disparity. The ratio of males to females in the initial Oñate colony was approximately 9: 1 (Hammond 1927). Over the next 80 years of settlement, the demography of the settler population changed. Thus, although incomplete (see Flint 2003 for a discussion of bias in muster roll reporting), the roll of Spaniards who fled the colony during the Pueblo Revolt (Hackett 1942) might more closely approximate the male: female ratios of the colony at the time Comanche Springs was occupied.

The exit roll identified 124 males as heads of households as compared to 74 females, 295 children and 184 servants (Hackett 1942). In other words there were 40 percent more males heads of households than females. In addition, no females were listed for 58 (46 percent) of those households, *but* 60 children were listed. So, where and who were the mothers of these children?

Women, regardless of ethnic identity, tend to be under-reported on muster rolls (Flint 2003). Thus, some of the mothers may simply have been left off the roll. This possibility becomes more likely if the women were native, and the unions unsanctioned by the church. Alternatively, although servants were reported in Pueblo Revolt muster roll, their sex was not. If Indian women were both mothers and servants, they could simply have been lumped in to the servant category. Finally, if native women were the mothers, they may have reasserted their identity during the Revolt and chose to align with the resistance and remain in the colony

Although it is impossible to go beyond the above suggestions, the sexual asymmetry in the colony and, at the time of abandonment, certainly raises the issue of a native women presence at Comanche Springs. If this was the case, then bringing native women into the settlement was, at least plausible. Perhaps the native record of activity at the settlement derives from native women and their children.

The gradual abandonment of the Salinas Mission is third source of Native, or Native and Spanish, who might have been drawn to the small settlement at Comanche Springs. As Spielmann (Spielmann, et al. 2009) has recently described, the tribute and labor demands of Salinas Native populations were extreme. These demands coupled with the increasing aridity in Rio Abajo (Parks, et al. 2006) made abandonment and/or escape more attractive and possible to both Spaniards and Natives.

In closing, I want to emphasize several points. First, there is nothing in the Comanche Springs record suggesting violence or even discord. Instead, my overall assessment of Comanche Springs is that the residents survived, in large part, because of cooperation, not conflict, or hegemonic power. This picture is very different from the Boltonian image of Spaniards as knights who brought civilization to the frontier. These folks were eeking out a living that was difficult in a region that was experiencing continued drought conditions. Second, I do not think Comanche Springs is unique. The bulk of the 17^{th} century Spanish population (small though it was) lived in small dispersed communities that were, to a large extent, unprotected. Add to this the growing realization that native populations through the seventeenth century were residential mobile. They too were dispersing. In short, We will not understand this part of the story by working in large aggregated communities or in Santa Fe. Systematic archaeological survey to locate the unobtrusive settlements is required that makes no assumptions about the nature of such places. I think it likely that our assumptions will be wrong. The hybrid communities of Early Colonial New Mexico are unique and essential for tracking the evolution of contemporary New Mexican society.

Acknowledgements: The research reported here was made by grants from the Valley Improvement Association. They provided support and access to Comanche Springs. Shawn Penman undertook the construction of the Comanche Springs map. Mike Spilde of the Institute of Meteoritics in the Department of Earth and Planetary Sciences provided help with the characterization of slag samples from Comanche Springs. Luminescence dating of the samples was done by James Feathers at University of Washington Luminescence Laboratory. Students who helped in the excavation included, Julie Angel, Jeremy Kulisheck, Cecil Lewis, Elizabeth Martinson, Benjamin Wood, and David Vaughan . Errors in understanding and interpretation are all mine.

References Cited

Barth, Frederick

1969 *Ethnic Groups and Boundaries: The Social Organization of Culture Difference*. Bergen, London.

Axtell, James

1988 *After Columbus: Essays in the Ethnohistory of Colonial North America*. Oxford University Press, New York.

Boyd, E.

1974 *Popular Arts of Spanish New Mexico*. Museum of New Mexico Press, Santa Fe.

Brooks, James F.

2002 *Captives and Cousins: Slavery, Kinship and Community in the Southwest Borderlands*. The University of North Carolina Press, Chapel Hill.

Deagan, K.

1983 *Spanish St. Augustine: The archaeology of a colonial Creole community*. Academic Press, New York.

1987 *Artifacts of the Spanish colonies of Florida and the Caribbean, 1500-1800*. Smithsonian Institution Press, Washington D. C.

Ellis, Florence Hawley

1989 *San Gabriel del Yungue as seen by an Archaeologist*. Sunstone Press, Santa Fe.

Flint, R.

2002 *Great Cruelties Have Been Reported: The 1544 Investigation of the Coronado Expedition*. Southern Methodist University, Dallas.

2003 What's Missing from this Picture? The *Alarde*, or Muster-Roll of the Coronado Expedition. In *The Coronado Expedition from the Distance of 460 Years*, edited by Richard Flint and Shirley C. Flint, pp. 57-80. University of New Mexico Press, Albuquerque.

Hackett, Charles W. (editor)

1942 *Revolt of the Pueblo Indians of New Mexico and Otermin's Attempted Reconquest, 1680-1682. (C. C. Shelby, translator)*. 2 vols. University of New Mexico Press, Albuquerque.

Hammond, George P.

1927 *Don Juan de Onate and the founding of the New Mexico*. Publications in History II. Historical Society of New Mexico, Albuququerque.

Hibben, Frank C., Ben Benjamin and Mildred S. Adler

1985 Comanche Springs: The Spanish Period at Comanche Springs, New Mexico; A silver Assaying Station of the early Seventeenth Century. *The Artifact* 23(3):41-78.

Ivey, James E.

1988 *In the Midst of Lonliness: The Architectural History of the Salinas Missions. Salinas National Monument Historic Structure Report*. Southwest Cultural Resources Center Project paper 15, Santa Fe.

Kessell, John (editor)

1989 *Remote Beyond Compare: Letters of don Diego de Vargas to his Family from New Spain and New Mexico 1675-1706*. Albuquerque.

Kidder, Alfred V.

1932 *The Artifacts of Pecos* Yale University Press fo Phillips Academy of Andover, New Haven.

Munson, Marit K.

2002 *O Boundaries and Beliefs: Rock Art and Identity on the Pajarito Plateau.* Anthropology. University of New Mexico, Albuquerque.

Nostrand, Richard L.
1992 *The Hispanic Homeland*. University of Oklahoma Press, Norman.

Parks, Jarmes A., Jeffrey S. Dean and Julio L. Betancourt
2006 Tree-Rings, Drought, and the Pueblo Abandonment of South-Central New Mexico in the 1670. In *Environmental Change and Human Adaptation in the Ancient American Southwest*, edited by David E. Doyel and Jeffrey S. Dean. University of Utah Press, Salt Lake City.

Ramenofsky, Ann F., C. David Vaughan and Michael Spilde
2008 Seventeenth-Century Metal Production at San Marcos Pueblo. *Historical Archaeology* 42(4):105-131.

Schaafsma, Polly
1994 The Prehistoric Kachina Cult and its Origins as suggested by Southwestern Rock Art. In *Kachinas in the Pueblo World*, edited by Polly Schaafsma, pp. 63-79. University of New Mexico Press, Albuquerque.

Scurlock, Dan, Peggy Gerow, David Kramer and Ron Stauber
1995 *The Cultural Resources of Tome Hill: A Multidisciplinary Investigation*. Office of Contract Archaeology, University of New Mexico. Contract No. 28-JV4-295; UNM Project 185-539B, Albuquerque.

Simmons, Marc
1969 Settlement Patterns and Village Plans in Colonial New Mexico. *Journal of the West* 8:7-21.

Spielmann, Katherine A., Tiffany Clark, Diane Hawkey, Katherin Rainey and Suzanne K. Fish
2009 "...being weary, they had rebelled": Pueblo Subsistence and Labor under Spanish Colonization. *Journal of Anthropological Archaeology* 28:102-125.

Vaughan, C. David
2006 *Taking the Measure of New Mexico's Miners, Mining, and Metallurgy.* Anthropology. University of New Mexico, Albuquerque.

Table 1. Luminescence Dates.

FS No.	Material	Location	Feature	Luminescence Age	Range	Percent Error
265*	Sherd, Biscuit B (highly burned)	Intramural C		1850 ± 15	1835–1865	10
238*	Sherd, soup plate	Extramural C	2	1805 ± 34	1771–1835	17.4
219	Salinas Redware (soup plate)	Intramural C		1713 ± 27	1686–1740	9.4
5117	Salinas Redware (soup plate)	Intramural A	55	1683 ± 32	1651–1715	10.1
237	Salinas Redware (soup plate)	Extramural C	2	1666 ± 28	1638–1674	8.4
231	Sherd, olive jar	Intramural C		1655 ± 28	1627–1683	8.3

*Unreliable dates due to anomalous fading

Table 2. Summary of Spanish and Native Elements.

Spanish Traits	Native Traits
Footprints of houses	Ceramics
Adobe brick, Structure A	Spindle whorls
Majolica and olive jars	Human figurines
Figurines	Lithics (not discussed here)
Metal Production	
Livestock (cattle, horses, sheep)	

Radiocarbon Dates

Beta Analytic No.	UNM No.	Structure	Weight (Grams)	Conventional ^{14}C Age (BP)	2 σ Calibrated Age (A.D.)
123695	307	Below C	150.00	560 ± 60	1295–1450
133651	5055	A	144.68	250 ± 50	1510–1595 1615–1680 1740–1805 1930–1950

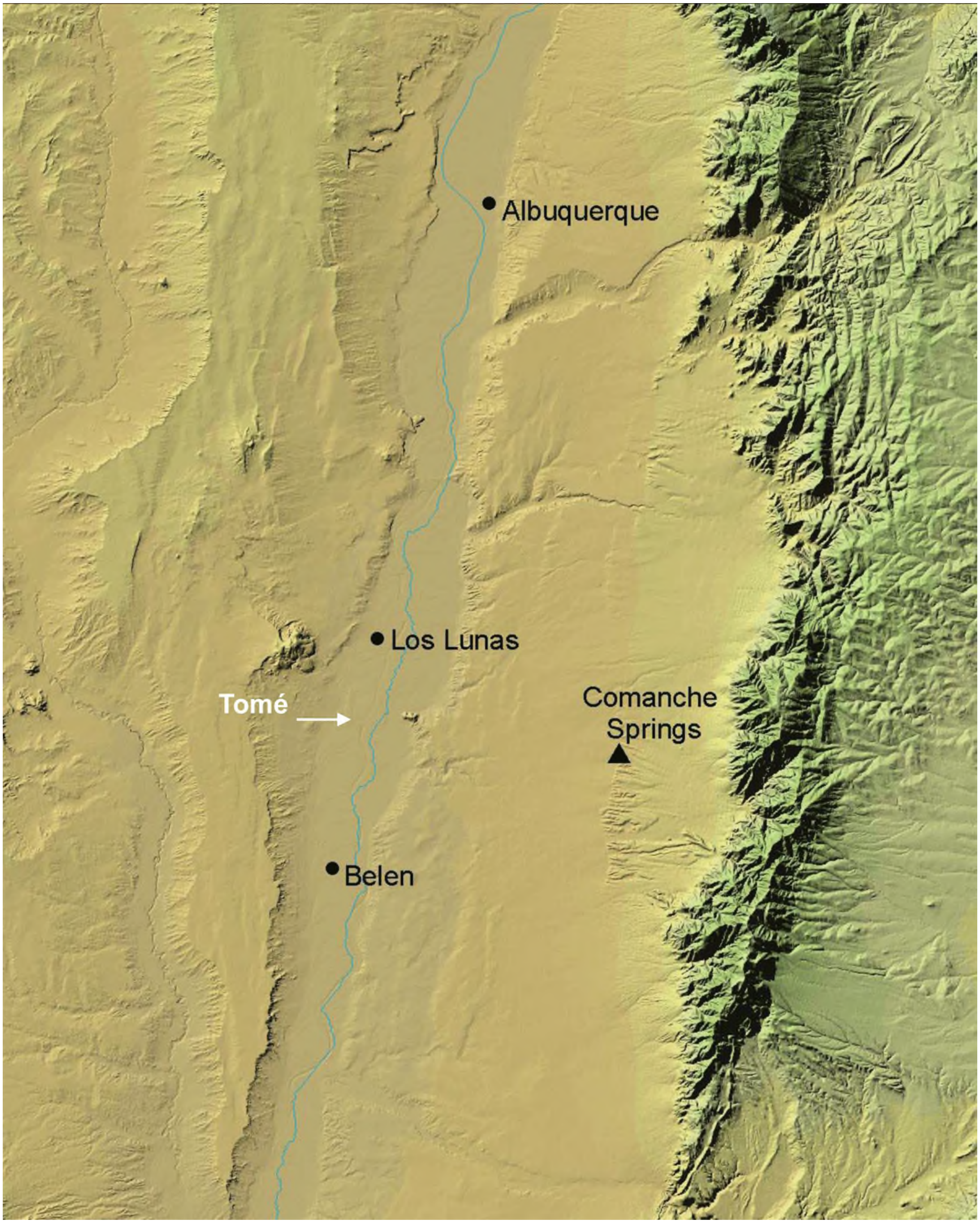


Figure 1. Location of Comanche Springs.

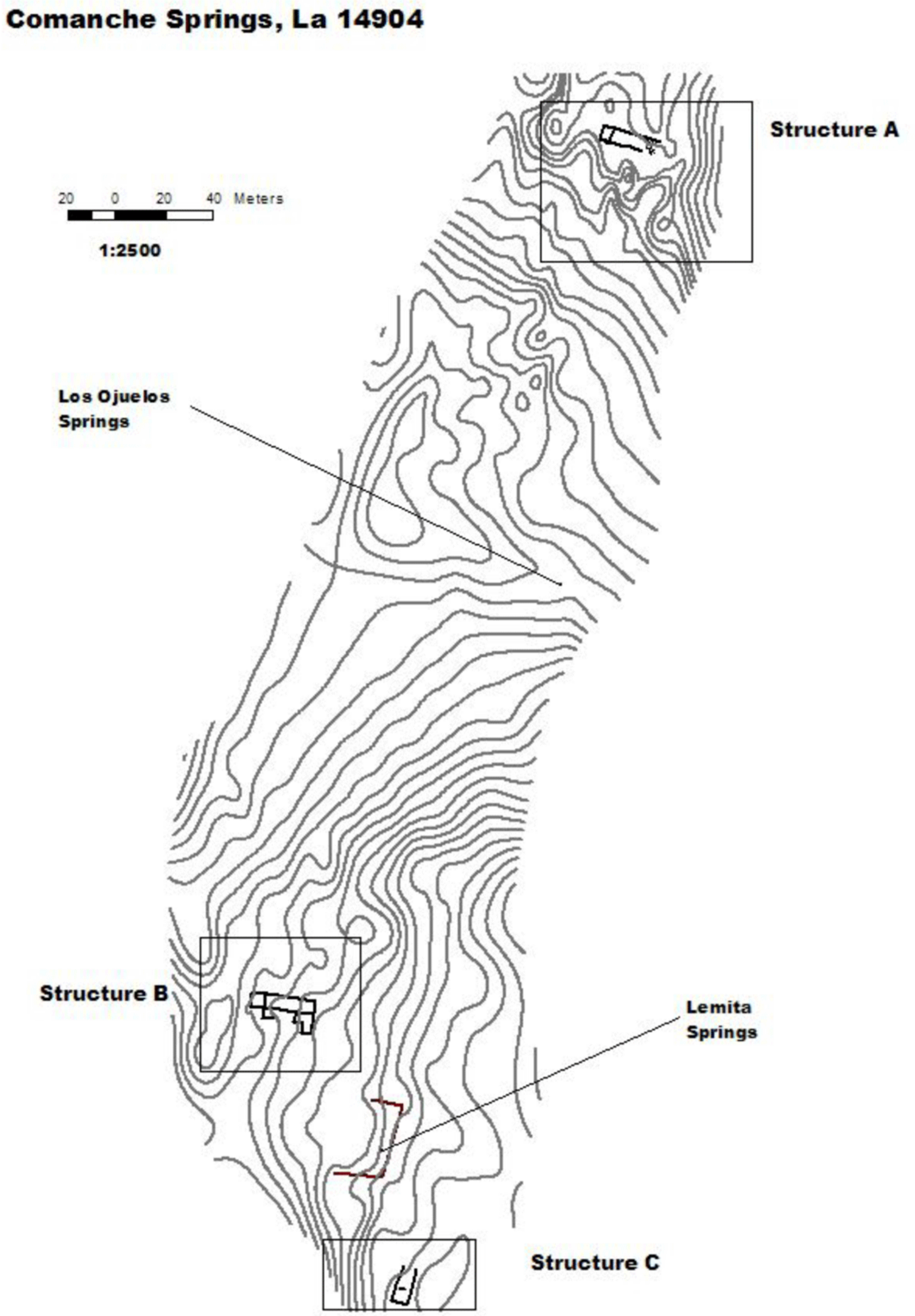

Comanche Springs, La 14904
Structure A
20 0 20 40 Meters
1:2500
Los Ojuelos
Springs
Structure B
Lemita
Springs
Structure C

Figure 2

Figure 3

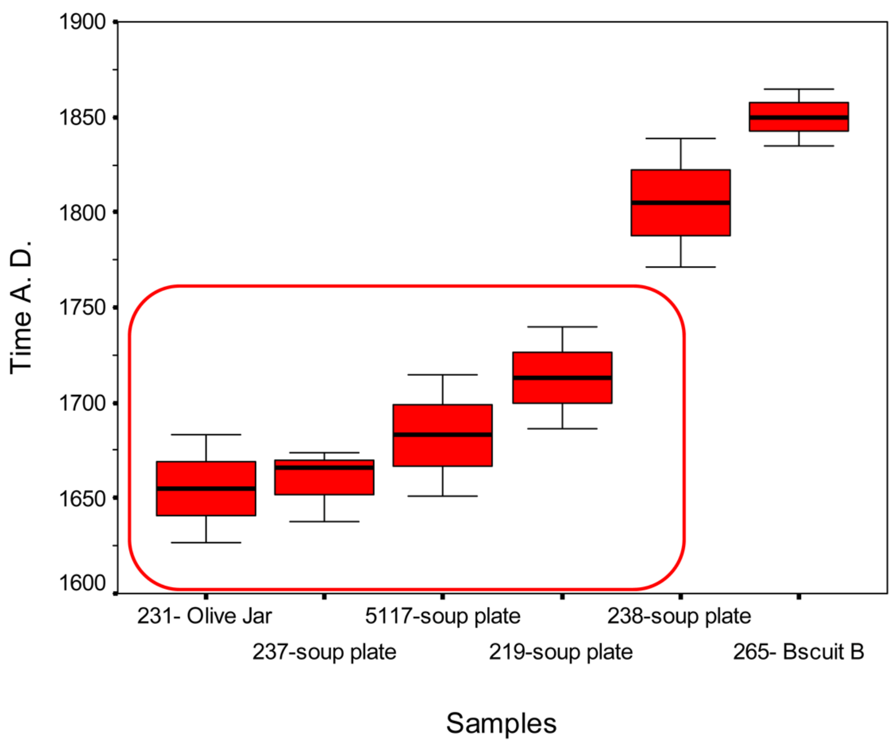


Figure 4

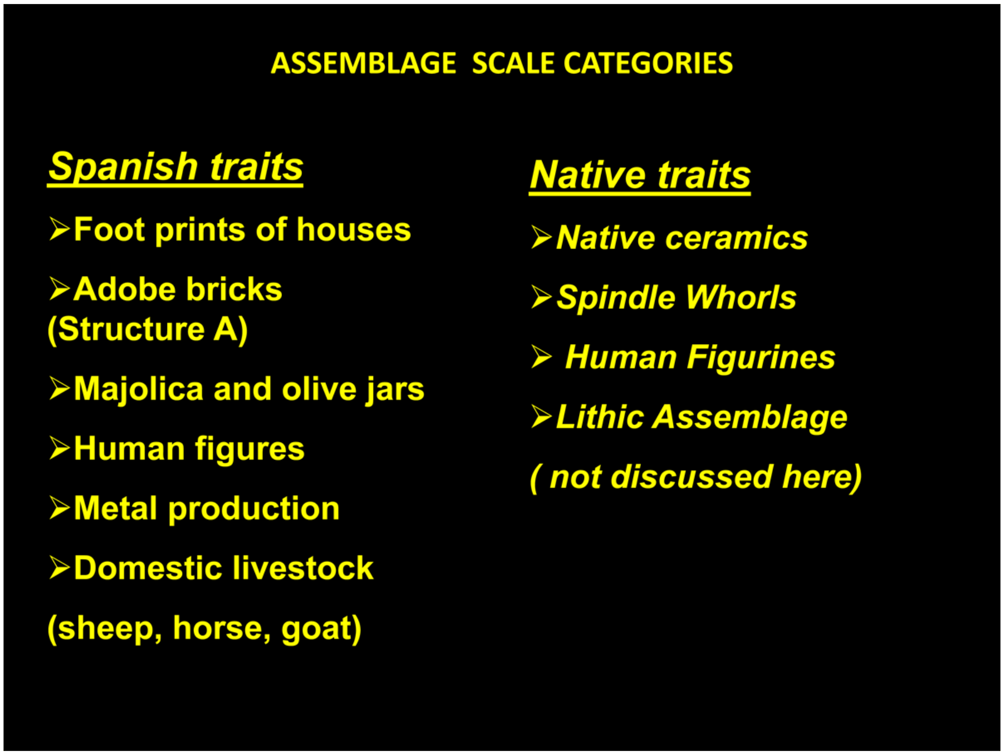


Figure 5

Figure 6

Figure 7

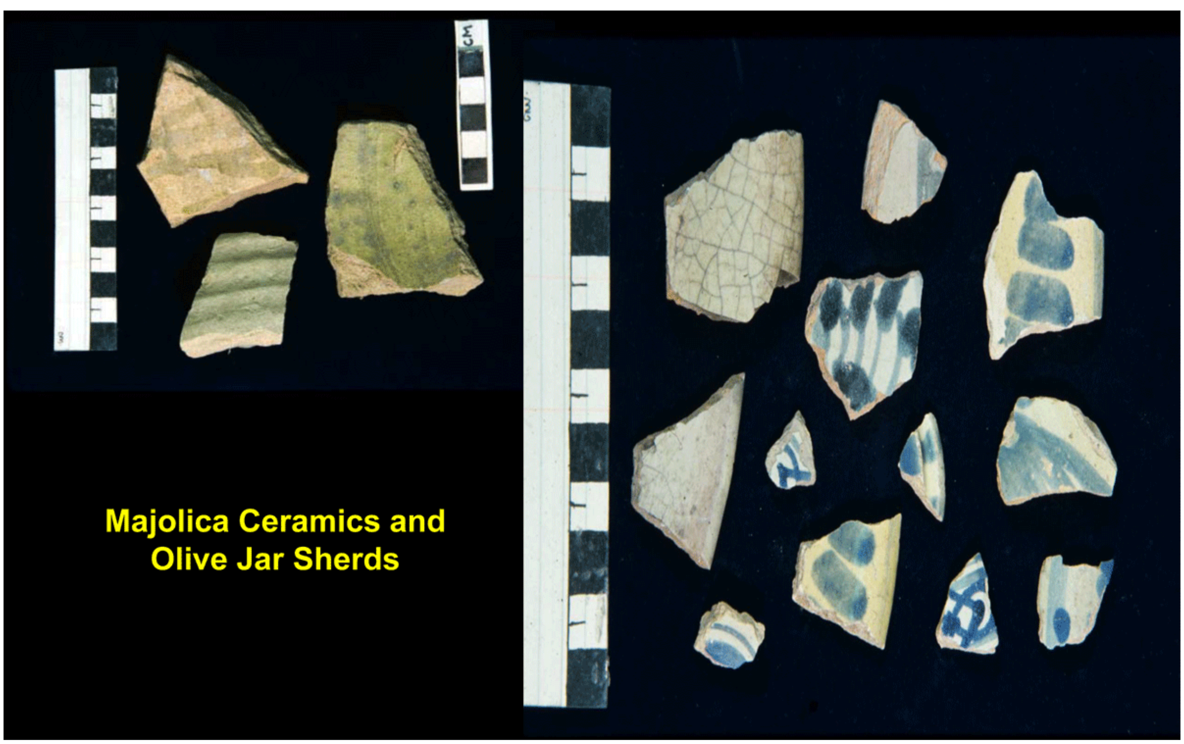


Figure 8

Figure 9

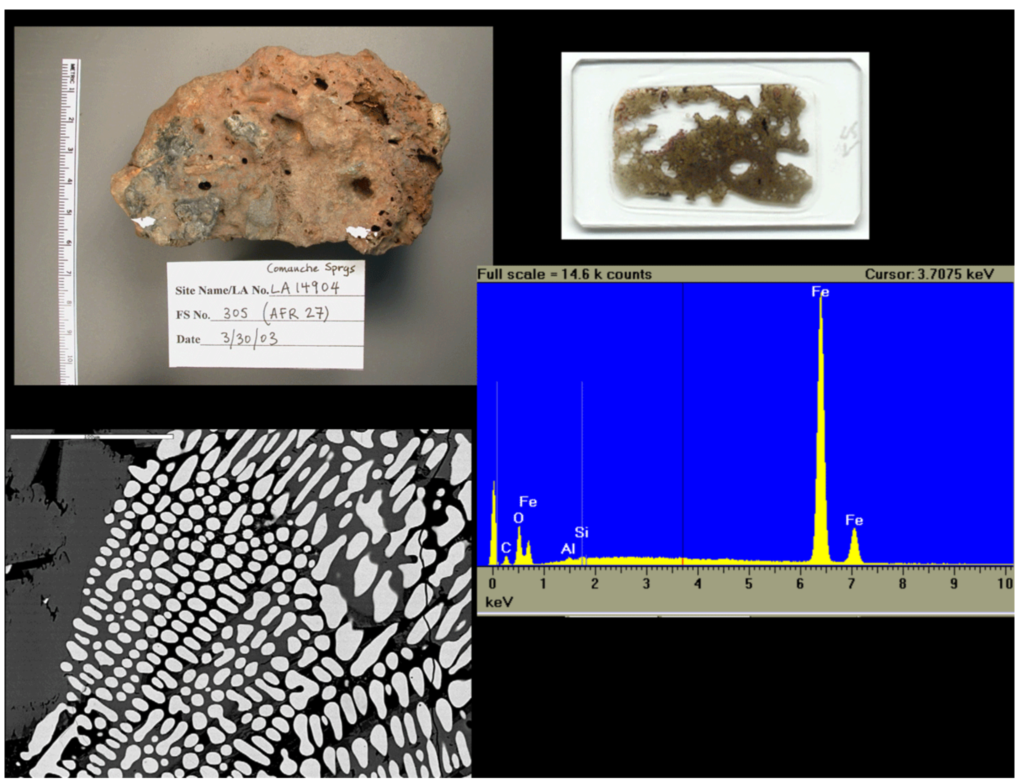


Figure 10.

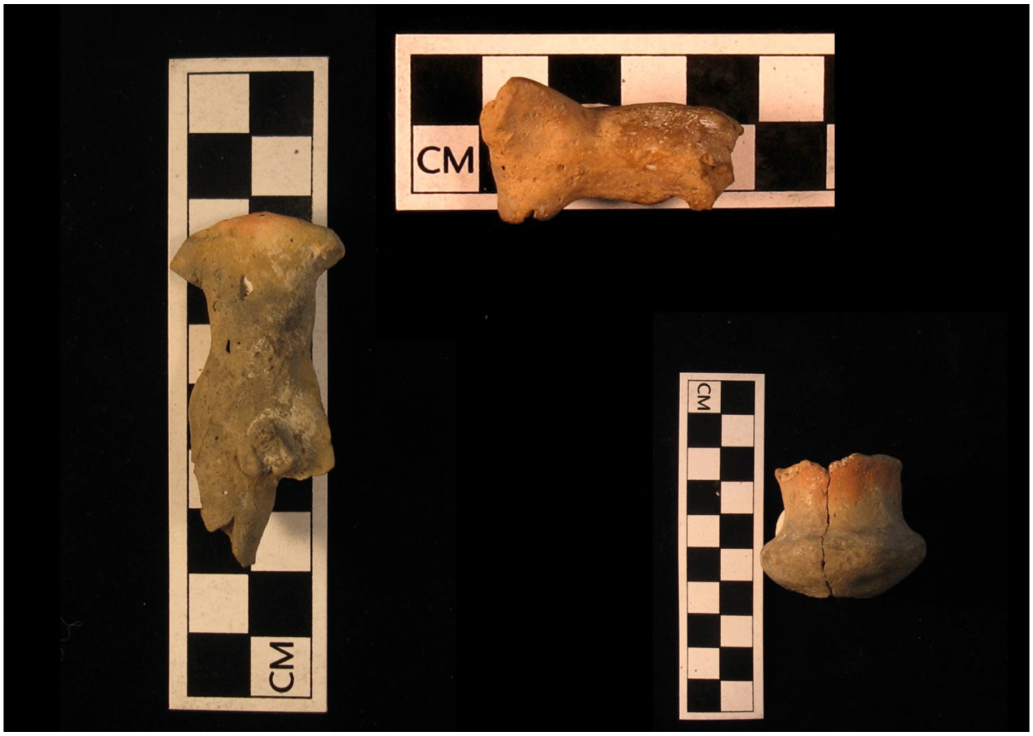


Figure 11

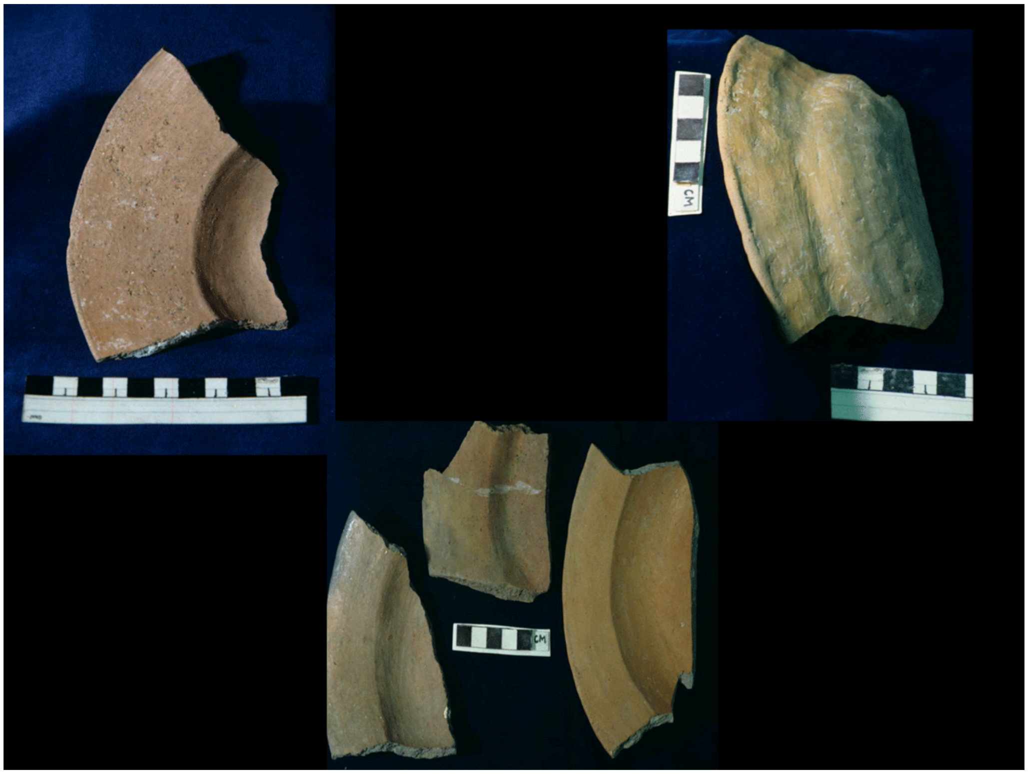


Figure 12

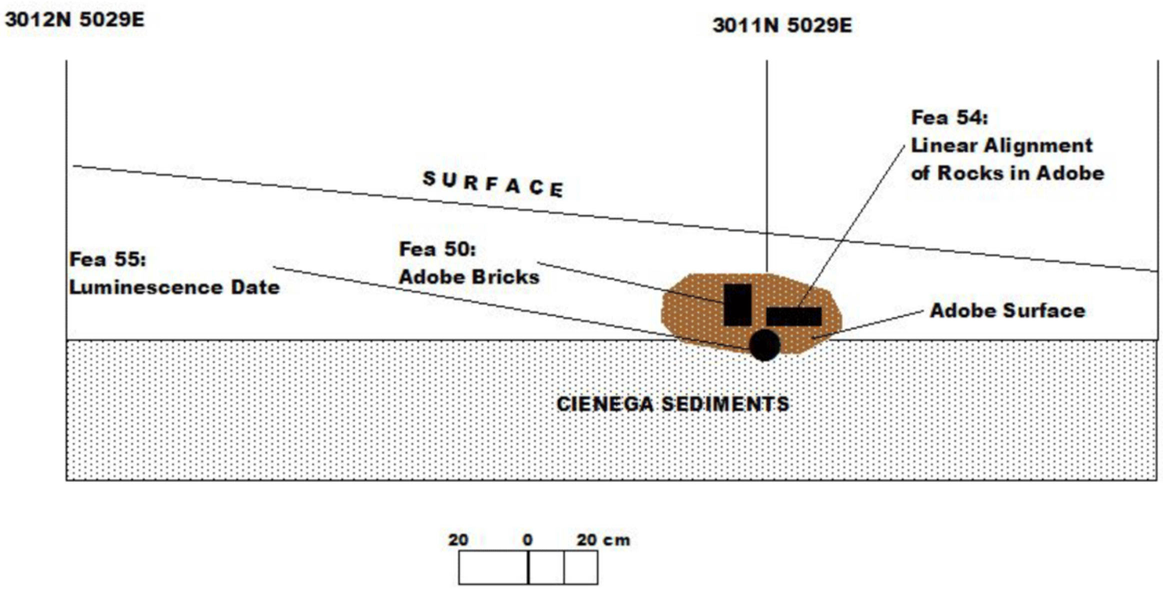


Figure 13

Figure 14

Figure 15

Figure 16